Gas Journal

JANUARY 8, 1936

Vol. 213 88th Year No. 3790

Editorial Notes

Coal

In our review of the year 1935, published in our issue dated Dec. 25, we discussed in some detail the circumstances which have led the coal industry—suppliers of our primary raw material—once again to the very brink of catastrophe; and catastrophe not for themselves alone, but for the whole nation. The efforts to stave off disaster—left, as is usual with coal trade troubles, until the last moment—are too recent history to require recapitulation here, but they culminated in a state of affairs which left the National Gas Council no other course but to recommend that gas undertakings should agree to increase the price of coal on existing contracts by 1s. per ton. Certain minor conditions and safeguards were attached to this recommendation, but only of such a nature as could be regarded as the very minimum possible in the circumstances.

It has been suggested from time to time in some quarters since the present mining dispute began that the Gas Industry, among others, has in some way or other been obtaining its coal at *unfairly* low rates. We ourselves have never been able to see this viewpoint, nor to regard it as unfair to make the best possible use technically of the coal we bought and then to make a success commercially of marketing our products. While we were quite prepared to see changes, and perhaps drastic ones, in connection with the production and marketing of coal, it came as something of a shock when the necessity was pointed out recently, with Government authority behind it, of increasing prices even on existing contracts. It is, indeed, a very sorry commentary upon the state into which one of our great national industries has fallen, that only release from contracts can give any hope of such reward to its workers as the nation regards as the minimum. It amounts almost to a serious undermining of business confidence, since the Britisher has for centuries traded entirely on the basis that his word is his bond, and that a contract is a solemn and unbreakable undertaking.

It can well be imagined, therefore, that the National Gas Council has not lightly made its recommendation, any more than have the other big coal consumers who have made a similar offer in the hope of averting the disaster of a national coal stoppage at the present juncture, when recovery from the industrial slump is well under way. But it is common knowledge that the Government has refused—rightly or wrongly according to one's political views—to shoulder responsibility in the matter, and the onus has therefore been placed to a very large extent on ourselves and other large consumers. It is, in fact, not too much to say that the Gas Industry, like other industries which have made a success of their business, has been placed in a position whereby it has been compelled to come to the rescue of one which has made just the opposite. Let it not be thought that we are unsympathetic of the difficulties which have long faced the collieries. The really dismal part of the whole business is that they *have* been faced so long with them, and that their efforts—if any—to put their house in order have been so feeble as to bring the country to the present desperate situation.

We believe the National Gas Council will receive general endorsement of the policy they have formulated, and that the Industry will agree that their representatives have taken the best course in extraordinarily difficult circumstances. There will certainly be agreement with the condition that the offer of one shilling shall be withdrawn in the event of a strike taking place, and we feel sure the public would wish such a condition to be attached. Indeed, although we would not wish to make capital out of it, the whole offer can scarcely be regarded as anything but public spirited, because almost alone in the community the Gas Industry would stand to gain directly by a stoppage, at any rate while coal stocks lasted. There will also be general approval of the stipulation that the extra money is to be devoted solely to increasing miners' wages. This has been the public's feeling all through, though we think there might perhaps have been rather more division of sympathy if it was generally realized how many years it is since small shareholders even in some quite efficient collieries drew one farthing of dividend.

And now, having done all we can possibly do in the matter, we must wait with the rest of the nation to see what the next few weeks bring forth. The offers of increased coal prices which we and others have been able to make cannot possibly meet the full demands of the miners; the coal owners themselves must do the rest, though it is fairly clear from known facts that there is nothing very immediate they can do. On the other hand, we have not the slightest doubt that, when it is clear that all possible has been done, the public, which has so far unanimously supported the miners' case, will expect them to show at least some sign of compromise, failing which they will quickly lose some of the backing which has carried them at any rate some way towards their requirements. If we have anything at all to be pleased about in the whole unhappy affair it is that representatives of the Mining Association have agreed to discuss with the Gas Industry, in connection with the offer, cer-

tain matters which have long enough worked most unjustly to its disadvantage. If any adjustment in our grievances results, at all events something will have been salved from the wreck.

Thirty Years

An interesting publication to make its appearance at the year end was the 40th half-yearly Bulletin of the Society of British Gas Industries. With what we sometimes consider almost an excess of modesty, the Society has always kept its affairs very largely to itself, and the Bulletin does not, we believe, circulate far beyond the members themselves. With the new responsibilities which the Society has now accepted—and in no light-hearted manner—as one of the constituent bodies of the British Gas Federation, more of the limelight is bound to be shed, whether they like it or not, on at any rate that part of their activities which is not purely domestic.

The fact that the present Bulletin is labelled " half-yearly " and " No. 40 " may mislead some into thinking that the Society is no more than 20 years old. A dip into the contents reminds the reader, however, that not only can the manufacturers' association boast of fifty per cent. more life than that, but they were able proudly to claim, at their 30th anniversary celebrations in the Autumn, that at the time of their formation in 1906, with the exception of The Institution of Gas Engineers, which is a professional body, there was no national body in existence to take care of the interests of any section of the Gas Industry. The Society was, in fact, one of the parents of the next national body to appear, having been jointly responsible with the Institution for the formation of the B.C.G.A. in 1911.

The membership in 1906 was 36 firms; at the time of the last Autumn meeting it was 157. The fact that the stalwarts in 1906 succeeded at all in forming an association of all the elements which go to make up that side of the Industry can be regarded as an outstanding achievement. That the association has survived, and after 30 years is going from strength to strength, is still more to the credit of the plant and appliance makers, especially when it is remembered that elimination of competition between individual firms—the bond which holds together so many associations of traders—has never at any time entered into the calculations of the S.B.G.I. In other words, the Society has existed all along for the general welfare of the very important section of the Industry which it represents, and so for the good of the Industry as a whole.

Perhaps even more gratifying than the total increase in membership over the 30 years is the fact that last year's addition of 19 new members constituted a record. When we welcome this as gratifying, it is not only in the sense of advantage to the Society itself, but to the whole Industry. We recall that a prominent gas engineer on a recent public occasion pointed out that it was helpful to gas undertakings not only that firms should be members of the Society, but also that they should more and more make use of the Badge. Far be it from us to suggest that a firm cannot be good unless it is a member; there may be perfectly sound reasons in individual cases for non-membership. On the other hand, membership definitely confers a status in the Industry which we believe will become increasingly valuable both to the members and to gas undertakings, and membership also ensures to the individual firm a voice in the co-operative working of the Gas Industry through the British Gas Federation. It is almost certain that these ideas will continue to impress themselves, and that, consequently, the Society of British Gas Industries will continue to grow, in its new-found vigour, stronger and stronger.

Sulphate of Ammonia

In last week's " Journal " we published an abstract of the 1934-35 Report of the British Sulphate of Ammonia Federation, which shows a considerable increase—a matter of 14%—in the various forms of nitrogen produced. Even so, synthetic nitrogen plants have on an average operated at only 43% of capacity during the year under review; the world production capacity for synthetic nitrogen is estimated at approximately 3,500,000 tons. Each main class of fertilizer showed an increase, ammonium sulphate increasing by nearly 6% over the 1933-34 figure. Though the development in recent years of production of " other " synthetic nitrogen fertilizers, particularly of lime ammonium nitrate forms, has continued, sulphate of ammonia retains the preponderance among the world's nitrogenous fertilizers, as it represents over 45% of the fertilizer nitrogen consumption. Actually home consumption of sulphate of ammonia showed an increase of only 421 tons, or 0·2%.

Gas undertakings, we suggest, might well co-operate more fully with the Federation by taking more advantage of the Federation's offer of window displays. During the year under review an entirely new display was offered to gas undertakings for their permanent retention, yet only 46 undertakings took advantage of it. Those which did, however, found that the plan led to increases in the local sale of sulphate of ammonia, particularly in small packages. Another feature of the year's work of the Federation which calls for note is the completion of three agricultural talking films which are to be shown throughout the country during the present winter season. In all these films, of course, the importance of nitrogen is stressed. As for membership of the Federation, this remains as in the previous year at 211.

Fixed Trust Movement

Right along from the introduction into the Gas Industry of the system of co-partnership, we have consistently recognized the immense possibilities of appeals to the small investor. That system, which may be described as profit-sharing in its broadest sense, has accomplished incalculable good among those towards whom it has been practised, by fostering the sense of responsibility which is the basis of good citizenship. Since Livesey's successful introduction of co-partnership—not so very long ago, in point of time—many things have changed, but these changes have not been such as to undermine the soundness of this principle; rather have they tended to lend it added support, in so far as they have encouraged individual ownership. Never before to-day were there so many facilities offered for persons of small means to become proprietors. No longer does ownership of house or goods present such difficulties as to discourage all but the most persevering aspirants; on the contrary, the path all too frequently appears to be over easy. In fact, it is true to say that this is the day of the small man, as well as of the big one.

Of late, the facilities extended to small investors have had a recruit, in the form of " fixed trusts," whose subunits can be easily acquired in the most modest amounts. These characteristics, and the auspices under which they have been created, have rapidly brought the trusts into great popularity. Though in operation before then, they were among the financial features of 1935. It is because of our unshaken belief in the beneficial effects of the individual ownership movement as extended to the small man, that we are eager for the full maintenance of the reputation of the fixed trust principle. Though our interest is thus mainly on general grounds, the Industry is directly concerned to the extent that shares in a few

of the larger gas companies are included in the list of investments of certain of the trusts. Pitfalls there are elsewhere in plenty for the unwary, and there is no need to have them added to in connection with fixed trusts. To render impossible the irruption of untrustworthy trusts, special legislation may be needed, and if so no effort should be spared to bring it about before the horse is gone from the stable.

For two years past a Sub-Committee of the London Stock Exchange have been studying the fixed trust movement, and quite recently the President of the Board of Trade stated in the House of Commons that the Government were awaiting the conclusions of this Committee before further considering the matter. The Committee have now issued an interim report, in which they agree that the fixed trust movement is expanding with great rapidity, and that, apart from a general loss of prosperity, it may be expected to continue to do so. They think that in this growth it is inevitable that, unless there is set up some standard to which all fixed trusts must conform, " the influence of competition will produce trusts which sacrifice stability and probity to the greater benefits which their creators can derive by the proffer to the public of promises which would not stand the test of well-informed examination." The Committee recognize the existence of a genuine public demand for a means by which the comparatively small investor may enter a slightly speculative but clearly defined field of investment with the benefits of a spread risk. There should undoubtedly be established such standards as will safeguard the public from exploitation by this means; and the Committee urge that the full measure of protection to which the public is entitled can only be achieved by legislation which can be universally enforced—such legislation being outside the scope of the authority of the Stock Exchange. It is therefore a matter for the Government, and it is to be hoped there may be no delay on their part in taking effective action. There is evidence that existing trusts are in favour of legislation to safeguard the public from incursion into the field of undesirable elements. More than this, they will no doubt be among the first to acclaim the institution of effective rules and regulations to this end.

Risk

On sea and on land, underground and in the air, there is risk in living. Quite recently there have been sad accidents on the railways and among the civil flying services. It is only a few months since a death roll of 40,000 followed an earthquake. So hazardous is the task of the miner that about one in every thousand of his kind is killed every year. Considering hazard, what about the 18 people killed and 600 injured every day on our roads?

As a scientific—and, if we may say so, a humane—enterprise, the Gas Industry supplies a vital necessity to over a million consumers in this country, which, in fact, means many more millions of people. It gives an unfailing service night and day and does all in its power to ensure that disaster shall not shadow this service. All records, all statistics, prove that, relative to the value of this service, the accidents attending the use of gas are negligible. Which does not in the least imply that a single accident is not the grave concern of our Industry.

Prior to the rejoicings of Christmas last there were a few—a very few—accidents caused by " gassing," one or two of which proved fatal. Prior to Christmas there were other accidents, fatal and otherwise, due to the employment of electricity, and about them we sympathize with the electrical industry. We have before us a copy of the *Glasgow Evening Citizen* for Dec. 27 which contains a leader entitled " Gas." It is an alarmist article. The writer must have combed the country for his fearsome message. He jumps from a story of the regrettable death of a man at Saltcoats, due to gas, to a tale of how at Earl Shilton, in Leicestershire, four people were found in an unconscious condition—again due to an escape of gas. " And so it goes on," he observes. " Every house fitted with gas has within it a potential menace. A single act of carelessness, or thoughtlessness, or damage to any of the main gas pipes in the vicinity, might lead to tragedy."

We suggest that the writer of the article in question has—and, we hope, temporarily—lost his sense of proportion. It would not take much effort on our part to issue grave warnings of the " potential menaces " which abound in every home and in every street. People have been known, for instance, to fall down stairs. Hence, stairs are a potential menace. But we will not labour the point; it is all too childish. With one underlying thought concerning the matter, however, we are concerned. Why should the Gas Industry, in seasons of good will and in times of lull, be singled out so frequently for harsh and unbalanced criticism of its failings? Other industries equally necessary to the comfort and well-being of the community definitely do not share the same fate. About gas, it seems, there is, in more quarters than one, a " nasty-mindedness." To us in the Industry it is perplexing; but its existence calls for greater positive effort to translate this attitude into goodwill.

Forthcoming Engagements

Jan.

11.—Scottish Junior Association.—Joint Meeting in Glasgow. Address by Mr. H. C. Smith.
13.—I.G.E.—Finance Committee, 1.45 p.m.; Membership Committee, 1.45 p.m.; General Purposes Committee, 3.15 p.m.
13.—I.G.E. Meeting of Benevolent Fund Committee of Management, 4.30 p.m.
14.—I.G.E.—Council Meeting, 10 a.m.; Gas Education Committee, 4 p.m.
15.—I.G.E.—Education Executive Committee, 10 a.m.
15.—B.C.G.A.—Executive Committee Meeting, 11.30 a.m.; General Committee Meeting, 2.30 p.m.
16.—Midland Junior Association.—Meeting. Paper by Mr. B. Green.
16.—S.B.G.I.—Council Meeting at 2.30 p.m.
16.—B.C.G.A.—South Wales District Meeting at Cardiff.
18.—Western Junior Association.—Meeting at Bath. Paper by Mr. F. G. O'Neill.
18.—Yorkshire Junior Association.—Meeting at Oldham. Paper by Mr. R. E. Stott.
22.—B.C.G.A.—Northern District Meeting at Newcastle-upon-Tyne.
23.—B.C.G.A.—Midland District Meeting at Birmingham.
24.—London and Southern Junior Association.—Meeting. Paper by Mr. T. A. Wolfe.
25.—Wales and Monmouthshire Junior Association.—Meeting. Paper by Mr. C. F. Petersen.
28.—B.C.G.A.—Manchester District Meeting at Manchester.
29.—B.C.G.A.—Yorkshire District Meeting at Leeds.
30.—B.C.G.A.—Eastern District Meeting at Cambridge.
31.—I.G.E.—Liquor Effluents and Ammonia Committee, 11.15 a.m.; Joint Research Committee, 2.30 p.m.
31.—B.C.G.A.—South-Western District Meeting at Exeter.

Feb.

6.—Midland Junior Association.—Meeting. Paper by Mr. G. C. Pearson.
8.—Manchester and District Junior Association.—Meeting at Darwen. Paper by Mr. J. A. Derbyshire.
8.—Scottish Western Junior Association.—Meeting.
14.—London and Southern Junior Association.—Meeting. Paper by Dr. F. J. Dent.
15.—Scottish Western Junior Association.—Annual Social.

Personal

Alderman Sir HOWARD STRANSOM BUTTON, J.P., Chairman of the Middlesex County Council, who received his knighthood in the New Year's Honours list, is Chairman of the Board of Directors of the Uxbridge, Maidenhead, Wycombe, and District Gas Company.

* * *

Mr. F. M. BIRKS, O.B.E., M.Inst.Gas E., has been appointed Deputy Chief Engineer of the Gas Light and Coke Company, and Mr. E. G. STEWART, M.Inst.Gas E., Assistant Chief Engineer.

* * *

Having rendered forty-five years' service in the Gas Industry, Mr. G. H. STEWART, of Cannock (Staffordshire), retired on Dec. 31 from the position of Engineer and Manager of the Cannock District Gas Company. He will, however, continue to be associated with the Undertaking as a member of the Board of Directors.

Mr. Stewart served his apprenticeship under the late Mr. C. B. Tully, and was later appointed Manager of the Ennis Gas Company, Ireland. He was subsequently appointed Works Manager of the South Bank and Normanby Gaslight Company, under the late Mr. W. Nixon.

In 1916 Mr. Stewart took over the position of Engineer and Manager of the Spennymoor and Tudhoe Gas Company, in whose service he remained until 1919. During the intervening period he was successful in reclaiming for the Company the public lighting contract previously held by the electricity undertaking.

It was in 1919 that Mr. Stewart went to Cannock to take up the position of Engineer and Manager of the Cannock and Hednesford District Gas Company at a time when the output was 103 million cu.ft.; by 1931, when the Company amalgamated with the Ogley Hay Company, this figure had increased substantially, and at the present time the output stands at 168 millions.

As already announced, Mr. Stewart has been succeeded by Mr. Charles R. Ingham, formerly Engineer and Manager of Brighouse Corporation Gas Department.

* * *

The Bury Town Council, at their meeting on Jan. 2, confirmed the appointment made by the Gas Committee of Mr. WALTER H. BATTERSBY as Gas Engineer and General Manager in succession to Mr. H. Simmonds. Mr. Battersby is a past-President of the Manchester and District Junior Gas Association.

Mr. ROGER MALONE, Distribution Superintendent, has been appointed Commercial Manager.

* * *

On medical advice, Mr. J. K. CAMPBELL has been reluctantly compelled to resign his position as Hon. Secretary and Treasurer of the Scottish Junior Gas Association (Western District), and, in his place, Mr. WM. KIRK, of the Motherwell Gas Department, has been elected to fill the position.

* * *

It has been pointed out to us that Mr. THOMAS A. ROWAN, whose appointment as Manager of the Grangemouth Gas Department was announced in last week's "JOURNAL," received his early training at Helensburgh, where he acted as Assistant for a short spell before going to Dumbarton as Assistant Manager, which position he occupied for some eight years prior to his appointment as Manager at Thurso.

Obituary

The Isle of Thanet Gas Light and Coke Company have sustained a great loss through the death, which occurred on Dec. 28, of Mr. WALTER HILLS, Chairman of the Directors for the past eighteen years. Though 87 years of age, Mr. Hills retained to the last the keen perception and business acumen which were so signally evident in his guidance of the Company for such a long period. It was his privilege and honour to see, during the time of his leadership, the price of gas in Margate decrease from 1s. 1·2d. per therm in 1921 to its present low figure of 7d. per therm.

Mr. Hills, who had the distinction of being the first Margate man to preside over the Board in the past fifty years, became a Director in 1911, and was elected Chairman in September, 1917, upon the death of Mr. L. Hart, of Ramsgate.

Alert and vigorous in spite of his advanced age, Mr. Hills was one of Thanet's foremost personalities, although of a somewhat retiring disposition, and was known as Margate's "Grand Old Man." He could justifiably claim to be the father of the legal profession in Thanet, and for thirty-six years, up to the time of his death, held the position of Clerk of the Peace. It was very seldom that he did not take his accustomed place at the Quarter Sessions. Articled to Mr. Toke Boys, he founded the firm of Messrs. Walter Hills & Shea—one of the best-known firms of Thanet solicitors—which has recently become Messrs. Walter Hills, Shea, & Girling. For thirty-nine years Mr. Hills was Registrar of Margate County Court and High Bailiff, and from 1902 to the time of his death he was Clerk to the Commissioners of Taxes. Another important Chairmanship he held for nine years from 1926 was that of Margate Pier and Harbour Company. On Mr. Hills' eightieth birthday the Directors of this Company and the Isle of Thanet Gas Light and Coke Company entertained him at lunch at a local hotel.

The funeral took place at Margate on Thursday last.

Correspondence

The Case for Electrification of the Railways

SIR,—I have read with considerable interest your remarks on the booklet entitled "The Case for Electrification of the Railways" issued by the Electrical Development Association and am cordially in agreement with them.

I would wish to say that you can definitely take it that railway electrification—even on suburban lines—is, on financial grounds, of doubtful value.

The extensive electrification of the lines carried out at huge capital cost around its London termini by the Southern Railway has received wide advertisement in the lay Press; but it is, I think, no exaggeration to state that had the displaced steam services been modernized (some of the locomotives employed were built in 1878!) and the signalling brought up to date, equal results would have been obtained at a fraction of the cost of electrification. Fares, in conjunction with frequency, speed, and regularity of service, are deciding factors in public support, and it is probable that the steam locomotive with its impress of latent power is a greater public advertisement than the covering devoted to the control of electrical equipment.

It is frequently and erroneously assumed that the present cumbrous and expensive system of electric traction represents the last word in railway transport, and no account is taken of the fact that, in all probability, it is likely to become obsolete with the advent of a more economical prime mover.

If this were to occur the railways would be unable to discard the electrical method of working on account of the colossal sums of money which had been sunk in its development so that once electrified there would be no further incentive to experiment with new and self-contained prime movers or to develop the thermal efficiency of the steam locomotive.

As a matter of fact, it is well recognized in many responsible quarters that there is no economy and probably considerable loss incurred in railway electrification, but, unfortunately, it is not the responsible authorities who are voluble on the matter.

Yours, &c.,
B. RICHARDSON.

"Graythwaite,"
Keldane Gardens.
Newcastle-upon-Tyne,
Jan. 3, 1936.

Sheffield's Excellent Publicity

Not so long ago—in the "JOURNAL" for Oct. 9, 1935—we commented editorially upon the deserved tribute to the excellent work of the Sheffield Gas Company voiced by Mr. S. C. Goodwin, Chairman of the Neepsend Steel and Tool Corporation, at the firm's annual meeting.

Again we find gas well to the fore in two industrial supplements recently published by two well-known Sheffield papers. Each supplement has about sixty pages, and the front page advertisement in both attractively extols the advantages of gas as an industrial fuel. "Gas is the Spirit of Industrial Activity" is the message of one of these splendid advertisements. The supplement to the *Daily Independent* includes an article on "Gas in the Home," dealing particularly with the practical cookery demonstrations which the Company is giving for the benefit of Sheffield housewives. There also appears a comprehensive article on the South Yorkshire Gas Grid, while another deals with the benefits conferred by gas on representative industries.

The supplement to the *Sheffield Telegraph* publishes an interesting article dealing with the increased demand for gas from both the industrial and domestic consumer.

The Directors of the Sheffield Gas Company and Mr. Raph Halkett, the General Manager and Secretary, are to be congratulated upon this really fine publicity, which is excellent propaganda for the Gas Industry.

News in Brief

A Contract with West's Gas Improvement Company for the re-setting of certain Glover-West vertical retorts at the Greenbank Gas-Works was approved on Jan. 2 by the Blackburn Town Council.

Each of 319 Houses forming the Napsbury Park Housing Estate has been supplied with 7 lighting points, 2 gas fires, and geyser, cooker, and copper by the Watford and St. Albans Gas Company.

New Vertical Retort Plant has been started up by Messrs. W. J. Jenkins & Co. at Milford Haven, and is reported to be giving very satisfactory results, both in output and thermal yield.

The British Chemical Plant Exhibition organized by the British Chemical Plant Manufacturers' Association, 166, Piccadilly, W. 1, is to be held in the Central Hall, Westminster, S.W. 1, from June 22 to 27.

A 10-years' Contract to supply gas in bulk to Earby was announced by Mr. J. E. Barrett, Chairman of Barnoldswick District Council, on Jan. 1 in connection with the progress made by the various Corporation Undertakings.

Applications are Invited by the Shipley Urban District Council Gas Department for the position of Works Chemist and Technical Assistant at a salary of £200 per annum rising by annual increments of £10 to a maximum of £250 per annum.

The Australian Gas Light Company, of Sydney, were inviting applications on Dec. 12 for £750,000 of 4% debentures at par, to be issued on Feb. 1, and which are to mature in 1956. Conversion privileges were offered to holders of existing debentures maturing this year.

Large Increases in Output by the Swindon United Gas Company (General Manager and Secretary, Mr. C. H. Chester) have necessitated an addition to carbonizing capacity, and Messrs. W. J. Jenkins & Co. have received an order from the Company for an extension of the intermittent vertical retort plant recently installed by them.

The Value of Gas to Industry is the theme of an article by Mr. H. D. Madden, M.Inst.C.E., M.Inst.Mech.E., Engineer and Manager of the Cardiff Gas Light and Coke Company in a trade supplement to the *Western Mail* for Jan. 6. Fuel costs in industry, Mr. Madden points out in the course of the article, are enormously more important than power costs, although this is not generally appreciated.

Nearly 400 People Were Present at the British Legion Institute, Swansea, on Jan. 3, when the B.C.G.A. films, together with three comedy films, were presented. The audience was very appreciative of the excellent programme. Mr. W. H. Johns, Engineer and Manager of the Swansea Gas Light Company, spoke of the benefits of gas in the home, while Mr. A. H. Shepherd, Showrooms Manager, referred to the benefits of gas to industry.

Greenock Public Lighting stands out well from a gas point of view, there being 1,801 gas lamps against 228 electric lamps, 44·9 miles of its thoroughfares being gas lighted while 7·5 only are lighted by electricity. Only 3·86 miles are unlighted. The price of gas for public lighting purposes is 2s. 6d. per 1,000 cu.ft. less 20%, while the charge for current is 1·25d. per unit. The total annual expenditure on public lighting is £5,265. The total consumption of gas for this purpose is 36,533,700 cu.ft. per annum. The B.S. Specification has been adopted for any new schemes since September, 1934.

Gas Profits were Never Larger than since the installation of electric light at Lisburn. A quarter of a century ago there were 1,077 gas meters in the town as against 3,393 to-day. Consumption has risen from 38,892,800 to 66,395,000 cu.ft. The present profits average £1,000 per annum. Over £75,000 of the ratepayers' money has been put into the works, and of this amount over £37,000 has been repaid. It is estimated that if the Works which the Urban Council purchased from the Gas Company at £33,000 twenty-five years ago were on the market to-day the sale price would be £75,000.

An Electricity Failure blacked out eight miles of public roads in the Lake District, including shops, public houses, cinemas, and libraries, for nearly two hours on the night of Jan. 6, when the supply failed from Troutbeck Bridge through Ambleside and Rydal to Grasmere. Picture-goers were refused admission to the cinemas, as there were no motive power and no lights. Shopkeepers in Ambleside, however, were grateful to their better judgment which had persuaded them to retain gas lighting when electricity came along. They were able to serve customers without interruption while tradesmen in other districts whose premises are lighted by electricity had to make use of torches and candles.

An Optional Multi-Part Tariff for large-scale users has been evolved by the Salford Gas Department, and where the load factor is good gas will be able to compete successfully with any other form of fuel. A considerable number of commercial and industrial users have taken advantage of this new tariff, and as a result the Department confidently expects that gas will have a much greater and more important rôle to play in the trade of the city than heretofore.

A Reduction in the price of gas at Tain by 5d. per 1,000 cu.ft. has been announced. The existing rate is 10s. per 1,000 cu.ft. The proposal was on a division carried by the Town Council. Objectors emphasized the heavy debt of £2,000 on the Gas Undertaking, and the threatened rise in the price of coal, as factors making a reduction inopportune. The majority approved the change with a view to stimulating consumption, and thus bringing about a reduction of the overdraft.

New Output Records have been established at Chester, and Mr. H. Hopkinson, Secretary of the Chester United Gas Company, reports that the consumption for the last week in December reached 12½ million cu.ft. Another record was established when over 2 million cu.ft. of gas were sent out in 24 hours. The previous records were established in February, 1929, at the time of the prolonged frost, when the River Dee was frozen for some time. This increase has been successfully met by the vertical retort installation which was only recently completed.

A Reconstruction Scheme has been started at Salford. The first stages, we learn from a local correspondent, involve the demolition of obsolete plant and buildings and will continue progressively as output demands. The scheme is understood to involve about £89,000. It comprises the modernization of forty vertical retorts and the addition of fourteen others of a smaller type, the provision of a coke-handling plant, and the installation of apparatus for the extraction of crude benzole. There is also to be an extension and rearrangement of stores and workshops.

An Appeal

The following appeal, which we have no hesitation in commending to those who have not received it direct, has been issued by the Irish Association of Gas Managers:

Dear Sir,

No doubt you have seen in the newspapers recently of the death of Mr. Maurice Drohan, who was Manager (for six weeks only) of the Cavan Gas Company. He had been unemployed for some considerable time, and was delighted to again be in charge of a gas-works. His time as such was very short for on the evening of Dec. 24, 1935, he was dead. In attempting to rescue a labourer from being gassed, Mr. Drohan made the supreme sacrifice of losing his own life, but his effort was successful on behalf of the other man who recovered. It is a grand thing to think that we have men like him in the profession, and it behoves us now to show our appreciation by helping his widow and eight children who are in deep mourning and financial difficulties. Will you please help this good cause as soon as you can, as it is urgently required?

Subscriptions to be sent to G. Airth, Gas-Works, Dundalk.

Yours faithfully,

Signed: P. J. MacEvoy, President,
G. Airth, Secretary.
Irish Association of Gas Managers.

Gas-Works,
Dundalk,
Jan. 6, 1936.

New Series of "Pioneer" Calendars

Interesting Production by W. C. Holmes & Co., Ltd.

Their many friends in the Gas Industry will be familiar with the novel series of "Pioneer" calendars which have been issued by W. C. Holmes & Co., Ltd., during the past few years. The illustrations on these productions have depicted pioneers in the Industry, both plant and personnel, and have thus formed a very interesting record of progress and achievement from the earliest times.

With the new year the firm commence a fresh series of etchings to accompany their useful desk calendars, and the subject of these still maintains its connection with the early days of the Industry. The first—for January to June, 1936—shows a cave at Bello Mill, adjacent to the home of William Murdoch, and the scene of his earliest

experiments. Messrs. Holmes acknowledge their indebtedness to Mr. J. W. Napier, the Engineer and Manager of the Alloa Gas Department, who obtained for them the original reproduction of Murdoch's Cave, from which the etching for their calendar was made.

Further issues in this series will appear from time to time, and W. C. Holmes & Co., Ltd., are to be congratulated upon the production of a calendar which combines utility with a definite historical value to the Gas Industry.

Gas Meters—Third Edition*

Meters have provided a live topic for discussion among gas engineers in recent months, and, therefore, the third edition of "Gas Meters—Their Construction, Use, Fixing, Inspection, and Maintenance," by Mr. Albert T. Gilbert, could hardly have arrived in more propitious circumstances. As recently as last November, The Institution of Gas Engineers received at the Autumn Research Meeting the Report of the Meters Committee; during the past year Papers on the subject of meters have been delivered to various gas associations; and by publishing communicated articles on the subject from time to time the "JOURNAL" has endeavoured to keep its readers abreast of the latest developments in meter design.

The ever-increasing need for supplying gas for industrial purposes under tariff schemes has directed the attention of the manufacturer to the evolution of a meter which will at once conveniently and satisfactorily show the maximum volume of gas taken over a certain period. But quite apart from the interest that is at the present time being taken in meter design, the publication is, we believe, the only one of its kind in the Industry. The fact that it has reached its third edition speaks eloquently of the need it has filled in the literature of our Industry.

The present edition has been enlarged to include dual and triple coin meters, refinements which still further meet the consumers' requirements, and two-part mechanism which caters for the industrial user. One feels, however, that the practical usefulness of the work would be largely augmented were the extensive historical introduction condensed in favour of an all-round lengthening of the descriptions of modern gas measuring apparatus. Mr. Gilbert, feeling that some of his readers may not agree with his "somewhat lengthy" authentic history of meter development, has apologized for this in the preface, but has not followed the modern tendency of abandoning the historical in favour of the practical which has become essential in view of the vast mass of technical literature that is now available. The author has endeavoured to make the work as comprehensive as possible, but regrets that owing to the silence of the makers concerned he has had perforce to omit some models of improved meters.

Such modern developments as the "night and day" double index meter, the "therm" attachment for the direct conversion of registered cubic feet into therms, and two-part tariff attachments are briefly explained. In addition to construction, testing, repairing, and fixing of wet and dry meters the author has devoted considerable space to high output and positive displacement meters. An appendix includes facts to be remembered, questions for students, and Board of Trade regulations and inspectors' addresses. The work is amply indexed and includes seventy-nine illustrations and diagrams.

"P. T. M."

* The Technical Press, Ltd., 5, Ave Maria Lane, Ludgate Hill, E.C. 4. Pp. 279 + xl.

"Journal" Calendar and Directory

Pointers to the 1936 Edition

The 1936 Calendar and Directory, the sixth of the series in the present form, varies sufficiently from its predecessors to merit a more extended introduction than usual. In the first place we wish to call attention to the rearrangement of the sections, whereby the Almanack and Diary open the book, followed by the Directory and the Handbook, with the three Trade Sections grouped at the back—a measure of rationalization which we think will make reference even easier than hitherto. The principle of dividing the main sections by insets of advertisement pages on tinted paper has been maintained.

The Directory.

In the Directory a most noteworthy addition has been made in the form of Part II.—Holding Companies, &c.; and from the correspondence already received it is clear that we have succeeded in filling a very real want. Apart from those at the hub of the movement, we venture to suggest that very few in the Industry would have been prepared to answer examination questions on the results of grouping activities during the last two years. Now they are revealed, if not at the familiar glance, yet by a few minutes perusal of pp. 122-124d of the Journal Directory. If in a few instances we are found guilty of such journalistic misdemeanours as "It is understood that" and "We believe," we may seek reprieve on the ground that the whole section was up to date of the week before Christmas.

It will be seen that the movement has gathered force, like the proverbial Russian steam roller. Whereas in our 1935 Directory the asterisks which betokened control numbered about 50, in the new edition they total 112 (excluding the British Gas Light Company, whose subsidiaries were not "starred" last year). It is significant, too, to note that four Companies have been registered which have not yet begun to exercise their wide powers of operation within the Industry.

The authorized share capital of the Companies totals nearly £10¼ million, of which approximately £6¼ million has been issued (again excluding the British Gas Light Company).

As for Part I.A—in the compilation of which so many hundred officials must wish a murrain on our heads, but earn our very real gratitude for their co-operation—the information contained therein is more complete than ever before. Certainly the picture of the Industry has changed greatly during the last five years. Apart from the holding company groupings referred to above, there have again been numerous amalgamations during the past year; and we need not further point to these here in view of the concise summary which appeared in the "JOURNAL" Review Number, Dec. 25, p. 891. Two other developments are noteworthy in the Industry, and are reflected in our Returns. First, the Editor is able to conclude that the Industry is making some beginning towards providing rational tariffs. Secondly, the Gas for Industry campaign appears to be making real progress—instance the remarkable increase of sales of gas reported from Swinton, and due, Mr. J. W. Brearley informs us, to considerable increases in industrial business. For the 1934 period sales were 197 million, of which 77% was industrial; for the 1935 period, sales were 471 million, 90% industrial.

The experimental omission of the County Classification from the 1935 Edition brought sufficient comments from our readers to persuade us that it is a real help to travellers; and it is accordingly reinstated this year—Part I.C, pp. 113-121.

The "Handbook."

This section has again received the close attention of Col. W. M. Carr and his collaborators, though we can indicate no major addition to, or alteration of, this "text book in brief." It remains, however, thoroughly up to date, with references to bottled gas, dustproofing of coke, and the Institution meter specification. The title page and arrangement of the progress graph and statistics at the front are claimed as an improvement, as is the removal of the index to a normal position at the back of the self-contained section.

The Trade Sections.

"The mere fact that you have an increase once again in the number of Advertisers is a clear proof of the usefulness of this book." We quote from a letter dated Jan. 2, 1936; but this fact need not deter us from acknowledging the co-operation of the record number of firms who, by taking advantage of a very sound advertising proposition, enable us to maintain the notably high standard of publication which we set ourselves in 1930. We have carefully maintained the standard, and are rewarded not only by the increasing number of—let us say proudly—beautifully printed advertisements, but by the interest taken in the Calendar and Directory which extends year by year throughout the Industry and brings inquiries even from those whom we regard as no more than "on the fringe."

LONDON & SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION

The Lacquer Research Laboratory.

VISIT

"Foochow" Paint Works

The interest which the Industry is taking at the present time in the important subject of colour finishes for gas appliances was typified by the large number of members of the London and Southern District Junior Gas Association who took part in a visit to the Mitcham Works of Donald MacPherson & Co., Ltd., on Saturday, Jan. 4, to witness at first hand the many processes involved in the manufacture and application of the well-known "Foochow" paints.

The visitors were welcomed at the Cock Chimney Works by Mr. R. P. Chester, the Managing Director, and were shown the various processes in detail from start to finish; for, although it was a Saturday afternoon, the whole of the works were in operation for the benefit of the members and in order to enable them the better to appreciate all the stages in the manufacture of the paints which are so largely used in the Gas Industry at the present time.

As recently as Dec. 4, 1935, a comprehensive account was given in the "JOURNAL," in the series of articles entitled "Long Service to the Gas Industry," of the development and present activities of Donald MacPherson & Co., so that it is hardly necessary to give here more than a few general details of the operations carried out in the various departments.

In the oil boiling and varnish plant linseed oil is polymerized by heat treatment and converted into a more durable medium for paints. Samples of the various gums, natural and synthetic, utilized in varnish manufacture were inspected. A bulk colour store contains the heavy pigments, including white and natural colours. The steps in the production of cellulose from the raw material to the finished enamels were witnessed, an interesting feature being the special methods of ventilating and lighting the shops in order to overcome any danger of fire. Decorating and coach finishing varnishes are stored in considerable quantities to mature in an equable temperature, much of this material being more than two years old.

An up-to-date and well-equipped laboratory is maintained at the works where analytical and routine work are carried out in order to ensure a lasting and durable product under the most severe conditions of use.

The different ways of incorporating a pigment into the medium were shown in the grinding departments, where the method adopted depends upon the texture of the colour and the desired fineness of the enamel. All liquid raw materials are delivered to various points through coloured pipe lines in the heavy grinding plant, where the paints for gasholders, steel structural work, and general industrial purposes are produced. The finished materials are filled into the various sized containers and finally transferred to the despatch department.

In addition to a room containing examples of all their different coloured finishes on gas appliances, there is a modern spraying department, equipped with the latest type of spraying apparatus, stoving ovens, &c., where the application of industrial finishes under actual working conditions may be studied. A staff of experienced demonstrators, forming the "Foochow" Service Department, is always ready to give advice and instruction in the handling of spray-gun apparatus and stoves, and those who have not yet experimented extensively with coloured finishes can call upon the assistance of these skilled technicians in regard to the most suitable equipment, cooker cleansing methods, and stoves to install, with proper reference to local conditions.

It is not without interest to record that a great deal of the machinery used in the works has been designed and developed by the firm's own staff.

Vote of Thanks.

At the conclusion of the inspection of the works the visitors were entertained at tea, when the PRESIDENT (Mr. J. M. Webber, of Croydon) voiced the thanks of the Association for an extremely interesting visit, which had really been a revelation. Not only had they seen a model works, but they had also learnt a great deal about paint. He did not know whether they generally realized that the works usually closed down on Saturday afternoons, but the firm had made special arrangements for the various machines to continue operations especially in order that all the processes might be seen to the best advantage; this was a concession which they very much appreciated.

About ten years ago, proceeded the President, a great change took place in the outlook of the Gas Industry. Until then all appliances were in black finish, and if a customer did not like it he had to take it as it was or do without it. Then it was realized that this state of affairs could not go on, and Donald MacPherson & Co. had always played a very prominent part in the subsequent production of coloured finishes. Indeed, the domestic appliance side of the Industry would not have been where it was to-day had it not been for the production of these wide ranges of coloured finishes for gas apparatus. Once more he thanked the firm very heartily for the opportunity of visiting their works.

Mr. S. F. DUNKLEY (Gas Light and Coke Company), invited by the President to speak, said that he was very pleased to have the opportunity of saying a few words on that occasion because it enabled him to express his personal gratitude for the tremendous amount of help and advice which this firm were always ready to give. Mr. Webber had just mentioned that it was about ten years ago that the demand for brighter finishes for gas appliances began to arise, and it was at that time that he was put in touch with Donald MacPherson & Co.—but in an entirely different connection. His problem then was to find a paint, which would be resistant to physical and chemical changes at high temperatures, for use on geyser flues. The temperature in the flue of a geyser was somewhere in the region of 350° to 450° F., and there were very few paints which would stand that temperature. There was no doubt that Donald MacPherson & Co. had given them material assistance in that direction, and they were now able to standardize coloured paints which would stand up reasonably to those temperatures. Thereafter followed the question of coloured appliances, and the paints they had seen in process of manufacture that day could be relied upon to be thoroughly resistant to temperatures as high as 250° C.

It was only that morning, continued Mr. Dunkley, that he had come across the original specifications required of these paints. Among these were physical and chemical immunity to change at high temperatures; non-fuming on the application of heat; non-susceptibility to colour change or flaking; unaffected by steam or by hot cotton-seed oil (for this oil was utilized in cooking, particularly in fish-frying); the paint must be quick-drying, and capable of two applications at one attendance; it must be suitable for exterior decoration work, and must be easily applied by comparatively unskilled labour; it must be free-running and give a non-streaky surface, and must be suitable for application by dipping as well as brushing and spraying. Donald MacPherson & Co., stated Mr. Dunkley, could supply paints which would definitely meet all these requirements, and great credit was due to the firm for the work they had done. They were undoubtedly the first firm to see the tremendous future of coloured finishes and the first firm to put them on the market in a commercial form. In conclusion, Mr. Dunkley referred to the cleanliness of the works; anyone who knew anything about paint realized that in the processes of manufacture and application absolute cleanliness was essential.

Mr. R. P. CHESTER (Managing Director of Donald MacPherson & Co.), in acknowledging the vote of thanks, which was most heartily accorded, said that this visit had given the firm very great pleasure indeed, and if they had been able to satisfy the members' search for knowledge in this connection, then they had been fully rewarded. He admired the way their Associa-

tion were ready to gather information on a Saturday afternoon, when they might be following other pursuits of a more congenial nature. In February of the previous year he had had the opportunity of opening a discussion on the subject of coloured paint finishes for gas appliances before the Southern Association of Gas Engineers and Managers, and in that connection he wished to express his gratitude for the help that the Industry as a whole was giving in assisting them to produce the coloured finishes they were manufacturing to-day. The Junior Associations were the backbone of the future, and, from that viewpoint alone, whatever service his firm could render would assist jointly the whole outlook in regard to gas and colour in the home.

He had endeavoured for their information to obtain a satisfactory definition of the word "paint." The dictionary definition was not very helpful, and he had evolved the following description, in a few words, which might be of interest to them:

> "Paint is a material consisting of particles of solid matter suspended in liquid or semi-liquid material which possesses the property of changing to solid form when exposed to the air in thin layers, thus producing an adhesive film which decorates and protects the surface to which it is applied."

They were one of the first people, continued Mr. Chester, to realize the possibilities of synthetic finishes, and produced their first example of this from phenol some sixteen years ago, at a time when they were trying to manufacture coloured finishes for jewellery, &c. In conclusion, he wished the Association every success, and said that there was no doubt that during the next few years they would go on from strength to strength.

Steaming in Horizontal Retorts

Reply to the Discussion.

Mr. G. L. Braidwood (Assistant Engineer at the Beckton Works of the Gas Light and Coke Company) replies to the discussion which followed his Paper before the Southern Association of Gas Engineers and Managers on Nov. 29 last. An extract from the Paper was published in the "JOURNAL" for Dec. 4.

The discussion was an extremely stimulating but somewhat lengthy one, and I was unable to do justice to it in the time at my disposal. Although I have replied verbally to a number of points which were raised, I should like to amplify my remarks with further comment in writing.

Mr. Nicholas suggests that steaming of retorts necessitates the fitting up of anti-dips where such are not already existing. It is certainly essential that the pipe at the near end should be shut off when steam is introduced; but there is no reason why one pipe could not be sealed off altogether, although obviously the benefit of having two ascension pipes to each retort will be lost. However, as stated in the Paper, where the charge is lightened on account of steaming, the defects due to one pipe only are largely nullified. The fitting of one anti-dip only would also be feasible.

No wear and tear figures were given in the Paper, as these were bound up with the cost of fitting up and the various alterations which were made during the experiments. A certain amount of attention and replacement will be occasioned on the part of the cocks and valves, and some leakage at joints and unions is likely to occur. No extra retort house labour or supervision was necessary at Beckton, nor should they be elsewhere.

In reply to Mr. Townsend, it was pointed out in the Paper that the same labour schedule was employed on the 12-hour as on the 10-hour duration; if this is reduced proportionately (in actual fact it would be rather less) the total cost per therm will be decreased by 0·05d. Mr. Townsend does not agree that some of the water gas is made from the retort carbon. But in the first place the loss of coke and breeze made for sale, which I believe to be correct, is in itself insufficient to account for the theoretical carbon required in the reaction with steam combined with the increase in fuel consumption; the balance must come from the retort carbon. Secondly, I suggest that because no scurf is to be seen on the retort after a certain length of time it cannot be assumed that none is forming. This is happening during the coal gas making period and being consumed while the steam is on. I regard this as an advantage rather than a disadvantage of the process. It is true that scurf helps to keep the retorts tight, but I see no reason why this factor should be jeopardized by steaming; it is only a matter of arrangement in regard to the periods between scurfings to ensure that there is always a thin layer of carbon on the retort brickwork. I did not say that retorts are less leaky with steaming but that the tightness is not impaired, and in view of the foregoing remarks I consider that this should be the case.

I agree that the higher temperatures necessitated by steaming are liable to cause extra wear and tear, but this is a point which time alone will prove. Mr. Townsend with a retort 3 ft. longer than those at Beckton, but of the same cross section, claims 106 therms per retort per day with steaming; but in our case this figure was 121 during the 10-hour duration tests.

Captain Shaw suggests that the cost per therm is increased largely because of drop in throughput; but as shown in the Paper, this is only responsible for a proportion, an additional loss being due to benzole and to the decrease in coke and breeze made. He considers that this loss in throughput might be avoided by charging normally and admitting steam when the charge has had time to shrink. We have attempted to steam with normal charges, and I am convinced that it is at any rate under our conditions quite ineffective, probably due mostly to the fact that Durham coals tend to swell rather than shrink. It is generally agreed that the charge must be burnt off by the time steam is admitted, but if the period before steaming be extended a further increase in fuel consumption will obviously result.

I should not describe the charges at Beckton as being unduly heavy for the steaming conditions, as the average weight during the experiments was 13·3 cwt. against 14·4 for normal conditions or a percentage full of 61·7 compared with 66·8. It seems to me desirable to have the retorts as full as possible, so as not to lose more than necessary on throughput, consistent with the certainty of maintaining a gasway over the whole length of retort. During the second 10-hour duration test the retort surface temperatures before steaming were 1,020° to 1,090° C. and at discharge 1,020° to 1,120° C.; I consider these quite hot enough for the required decomposition. Capt. Shaw admits a theoretical loss of 50 lb. of carbon per charge for the steaming reaction, and I would suggest that a further loss of coke will be found on the part of the producer which is supplying the extra heat for the process.

I should like to stress the fact that the damage to retort silica and mouthpieces and the blockages in orifices, &c., referred to has, to all intents and purposes, ceased since the period in question. Discontinuation of the former I attribute to the drier steam instituted.

I agree with Mr. Gray that it is highly desirable to have dips of as positive a character as possible; it was also suggested that in the case of sleeve dips of the Beckton type the tar seal might be destroyed during the steaming period, but provided there is a uniform gasway and undue pressure in the retort avoided it does not seem likely that any considerable quantity of steam would escape through the sealed dip—always assuming there is a reasonable seal and that the dips are not unduly slack. Under test our anti-dips were reasonably tight.

Regarding the low C.V. of 480 B.Th.U. during the 12-hour duration test, as explained in the Paper this was due to the rather abnormal vacuum in vogue in order to avoid any loss from pressure in the retort, so that the greatest possible yield per ton of coal might be obtained. It will be seen from the published figures that the C.V. during the first of the 10-hour durations was 504 B.Th.U. Since that time a further test has been carried out on 10-hour duration with ½-tenth in. w.g. pressure in the retort, resulting in a C.V. of 500 B.Th.U., but the nitrogen has decreased from 11% to 7·8%. The C.V. is no doubt affected largely by the quality of coal being carbonized at the time. Steam admitted was 10·1% by weight of coal and water gas therms 6·4 per ton of coal; total therms per ton 81·1. It is evident that 1,385° C. in the combustion chamber under our conditions is the economic limit since trouble with stopped ascension pipes is becoming apparent.

Regarding other points of a controversial nature which have been raised in the discussion, I think my views are made clear in the findings and conclusions expressed in the Paper.

Finally, in assessing the cost per therm of normal straight coal gas an allowance was made for 3 gallons of benzole being stripped. None was made in the case of the steaming experiments because the C.V. was reduced to a degree which made extraction impossible. The figures are all for material and labour only. As has been pointed out the steaming process in the retort house must logically bear part of the capital cost expenditure of the retort house in proportion to the time occupied by steaming when otherwise coal gas would be made; this will have an appreciable effect on the all-in cost of production.

The question as to whether and under what circumstances steaming will pay is so dependent on local conditions and a variety of considerations that a separate decision must be arrived at in each case.

I wish to draw attention to a misprint in the Paper under the heading "Coke and Breeze" (p. 702 of the "JOURNAL" for Dec. 4). The fuel consumption figure of 3·99 cwt. should be 3·59 cwt.

LONG SERVICE TO THE GAS INDUSTRY

A number of firms of long standing on the contracting and manufacturing side of the Industry have collaborated with the "JOURNAL" in the production of a series of articles, under the above title.

Falk, Stadelmann & Co., Ltd.

This Company has been associated from its earliest days with the supply of gas consuming appliances. Founded in 1882 by the late Salomon Falk, it has been responsible for placing on the market a number of commodities which, in their time, rendered good service to the Industry and were the forerunners of a range of lighting appliances, &c., developed on similar lines, and looked upon as being epoch-making in their day.

The nucleus of the original business was the supply of genuine steatite flat-flame and circular (Argand) burners in various forms, manufactured by Jean Stadelmann, and which had a world-wide reputation. The supply of complementary accessories followed, and included the first Jena hard glass for upright burners, subsequently so designed as to intensify and improve the efficiency of incandescent lighting.

Early in the century, the first mantle, under the brand "Veritas," was produced. This, by reason of its greater durability, higher efficiency, and unshrinkability, gradually ousted the less satisfactory mantle made from a cotton basis, then in general use. There are probably few who do not remember two of the number of well-known humorous posters associated with the "Veritas" mantle—viz., John Hassall's "Lamplighter" and Alfred Leete's "Housebreaker."

The upright burner incandescent arc lanterns for outdoor and indoor use, also self-intensifying high-power lamps which followed held the field for years and marked an era of furious scrapping of non-mantle forms of lighting. This was succeeded by the Graetzin inverted burner, the first of its kind used with a closed glass globe, and the successful Graetzin lantern series for outdoor and indoor use, fitted with intensifying glass sleeve and bowl, a type still to the forefront.

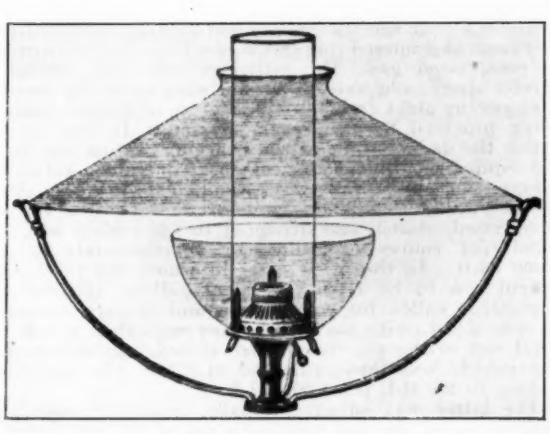
In 1904 the Company was manufacturing, according to its own designs, at its Birmingham Works, a range of inverted burners of high-grade quality and efficiency, and which were marketed under the well-known trade mark "Veritas" and "Vesta-Veritas" (the latter pattern taking a closed globe).

In 1919, the Veritas Mantle Works, in Garratt Lane, Wandsworth, were founded. The buildings and ground cover an area of 7 acres, and now find employment for 450 hands. Of more recent date is the manufacture of the now extensively adopted artificial silk mantle, in the main for street lighting, on account of its suitability for securing the highest lighting efficiency and durability under outdoor conditions.

In 1925, a foundry was acquired at Warrington, and subsequently removed to Rainhill, near Liverpool, where gas cookers, gas fires, and similar appliances were produced. This foundry covers an area of nearly six acres.

The ever increasing demand for gas consuming devices meanwhile necessitated considerable expansion of the Works of the Company and those owned by its subsidiaries. Not only were the Burner Factories and Rainhill Works largely extended, but a new Works was erected in the environment of Birmingham for the manufacture of light fittings, &c.

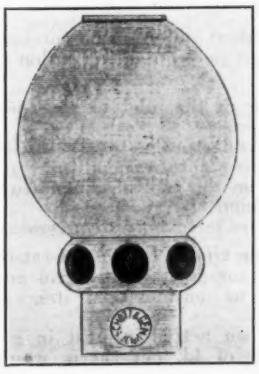
The Company claims to occupy an unique position in the Gas Industry, in as far as it serves this Industry by its Wandsworth Works for gas mantles, by its Rainhill Works for gas cookers and gas fires, and by the Birmingham Works for burners, fittings, and accessories.



Circular (Argand) Burner.

Right.—The "Vesta-Veritas" Brass Burner.

Below.—The Jena Combination Globe.



The Company has branches in the more important provincial centres of the United Kingdom and Ireland, as well as in Australia, New Zealand, and South Africa, and finds employment to-day, directly and through its subsidiary Companies, for approximately 2,800 people.

By the development, manufacture, and marketing of practically every appliance and accessory used for the consumption of gas, the Company shows its confidence in the future of the Industry.

One of the well known posters which made the name of the "Veritas" mantle a household word.

An early Incandescent Arc Lantern.

EXAMPLES OF THE FIRM'S MODERN PRODUCTIONS.

Left.—An attractive chromium-plated art pendant.

Right.—The new "Bakerloo" cooker, fitted with automatic lighter and "Autokook" control.

Compressed Gas as a Fuel for Motor Transport

by
R. COOK, M.Sc.,
of the Fuel Research Station

From a Paper presented at a Joint Meeting of the East Midland Section of the Institute of Fuel and the Society of Chemical Industry, at University College, Nottingham, on Friday, Dec. 13.

The Economic Possibilities of Compressed Gas Propulsion.

Probably the most convenient method of comparing the operating costs of vehicles propelled by compressed gas, heavy oil, and petrol respectively is to express those of the two former fuels in terms of "the cost per equivalent gallon of petrol." The cost for equivalent gallon of petrol (hereafter referred to simply as "cost for equivalent gallon") for compressed gas represents the purchase price of petrol at which the operating costs of the petrol vehicle become the same as those for the compressed gas vehicle. Similarly, the cost per equivalent gallon for heavy oil represents the purchase price of petrol at which the operating costs of the petrol vehicle become the same as those for the heavy oil engined vehicle.

To arrive at the cost per equivalent gallon for compressed gas we must add together the cost per equivalent gallon of the following items:

(1) The initial cost of the gas at the inlet to the compressor.
(2) The cost of compression and storage together with interest and depreciation on capital expenditure.
(3) Interest and depreciation on the capital expenditure involved in vehicle conversion.
(4) Any additional licence duties incurred by conversion.

Experience shows that the remainder of the operating cost may be assumed to be the same for both petrol and compressed gas propulsion. Let us consider these items in turn.

Those gas authorities taking an active interest in gas propulsion consider that a price of 4d. per therm would yield them a reasonable profit. Now 1·25 therms of gas is equivalent in the engine to 1 gallon of petrol, so that, if we allow 5% for leakage, the cost of the gas at the inlet to the compressor works out at 5·22d. per equivalent gallon.

The cost of compression and the interest and depreciation charges on the compression and storage plant will depend upon the capacity of the charging station and the nature of the service to be provided for. The more uniform the demand for gas and, within limits, the larger the plant, the smaller will be the costs of compression and storage.

About a year ago the Author had occasion to investigate two cases of proposed conversion of a fleet of petrol vehicles to compressed gas. The estimates were the subject of careful study, adequate provision being made for standby compressing plant and an ample margin of storage capacity being provided to meet peak demands. In one case in which the daily output of the charging station was to be 265 equivalent gallons the cost per equivalent gallon for compression and storage was estimated to be 4·26d. With gas at 5·22d. per equivalent gallon the total cost of the gas, compressed, stored, and delivered to the vehicle was thus 9·48d. per equivalent gallon, or approximately 3s. per 1,000 cu.ft. In the other case, in which the total daily output was to be 1,440 equivalent gallons, the cost per equivalent gallon for compression and storage amounted to some 2·31d.; with gas at 5·22d. per equivalent gallon, the total cost of the gas compressed, stored, and delivered to the vehicle was thus estimated at 7·53d. per equivalent gallon, or 2s. 4½d. per 1,000 cu.ft.

The latter was an exceptionally favourable case. In general it may be said that with gas at 4d. per therm at the inlet to the compressor the cost of the gas compressed,

stored, and delivered to the vehicle should be some 2s. 6d. to 3s. per 1,000 cu.ft. according to circumstances. Incidentally it is interesting to note that the range of price actually obtains at those compressing stations in service at the present time.

The cost per equivalent gallon of vehicle conversion charges will depend in the first place upon the radius of action required and in the second place upon the fuel consumption. Circumstances favourable to compressed gas are: (1) Nature of service, such that the vehicle can recharge frequently, and (2) a high daily fuel consumption.

Licence duties on public passenger-carrying vehicles are based upon seating capacity and are the same for compressed gas, heavy oil, or petrol propulsion. The maximum gross weight of each type of omnibus is, however, fixed by Ministry of Transport Regulations and in the case of double-decker 'buses this limit is already closely approached in many instances. Conversion to compressed gas would therefore entail a reduction in pay load. With single-decker omnibuses the maximum gross weight is usually well within the legal limit so that this type is more favourable for compressed gas propulsion.

In the case of goods-carrying vehicles the licence duties are based upon unladen weight, and up to and including a weight of six tons the duties for compressed gas vehicles are identical with those propelled by petrol or heavy oil. No allowance is made, however, in respect of the weight of vehicle cylinders so that conversion to compressed gas frequently entails the payment of a greater licence duty. Representations on this point have been made to the Government by the National Gas Council, who have pointed out that in the case of electrically propelled vehicles an allowance is made in respect of the weight of batteries when assessing licence duties. So far these representations have not met with success.

To arrive at the cost per equivalent gallon in the case of heavy oil we must add together the cost per equivalent gallon of the following items:

(1) The initial cost of heavy oil with an allowance for the greater thermal efficiency of the oil engine.
(2) The additional capital charges incurred by the higher cost of the oil engine.

The remainder of the operating costs may be assumed to be the same for either petrol or heavy oil propulsion.

Goods-Carrying Vehicles.

As the radius of action of a gas-propelled vehicle is restricted by the size and weight of the storage cylinders to some 60 to 75 miles on a single charge, the most favourable case is probably that of vehicles engaged on collection and delivery work in large towns. Such vehicles generally cover some 8,000 to 12,000 miles per annum. Many goods-carrying vehicles cover much greater annual mileages but in general they are not suited to gas propulsion since their service conditions are such that frequent recharging at a limited number of charging stations is impracticable.

It is therefore proposed to examine the operating costs of a number of typical goods-carrying vehicles, varying in size from one ton to five tons and covering 8,000 to 12,000 miles per annum, when propelled by compressed gas, heavy oil, and petrol respectively. The operating conditions have been taken to be as follows:

(1) Number of working days per annum = 307; number of working days per week = 5½ = 281 full working days per annum.
(2) Compressed gas vehicles to recharge once per day and to be provided with sufficient gas cylinders to give a margin of at least five miles on a normal day's run.
(3) Compressed gas to vehicle at 2s. 6d. per 1,000 cu.ft.
(4) Cost of heavy oil at 1s. per gallon.

Further particulars of the vehicles considered are given in Table I.

TABLE I.—*Particulars of Goods-Carrying Vehicles.*

Class in Tons.	Unladen Weight on Petrol.	Miles per Gallon.		Additional Cost of Heavy Oil Engine.
		Petrol.	Heavy Oil.	
				£
1	1–15–0	12	..	..
1½*	1–19–1	10·5	..	..
2	2–12–0	9·0	18·0	125
3	2– 8–0	7·0	14·0	113
4*	3–18–1	5·4	11·9	240
5	4– 8–0	5·0	11·0	240
5*	3–19–0	5·0	11·0	240

Of the seven cases chosen, three (*i.e.*, those marked with an asterisk in Table I.) would be subject to additional licence duties when running on compressed gas.

The cost per equivalent gallon for these vehicles when propelled by compressed gas and heavy oil respectively are given in Table II. The manner in which these figures are arrived at can be seen in Appendix I., which gives the detailed calculations for the 4-ton vehicle. In studying Table II. it should be borne in mind that while commercial petrol is sold at 1s. 4d. "at the pump," 1s. per gallon is a customary figure at the present time to many large users.

A study of Table II. leads to the following conclusions as regards goods-carrying vehicles:

(1) That for vehicles of less than two tons (*i.e.*, those classes for which oil engines are not yet available) compressed gas may be economic, particularly if the unladen weight on petrol is such that no additional licence duties are incurred on conversion and where the annual mileage is about 10,000 to 12,000.
(2) That for vehicles of two tons and over heavy oil constitutes the real competitor to compressed gas. In none of the cases examined can compressed gas compete with heavy oil under present conditions.
(3) That an allowance in respect of weight of vehicle storage cylinders when assessing licence duties would not, in itself, enable compressed gas to compete with heavy oil under present conditions.
(4) That the greater the annual mileage the greater is the economic superiority of heavy oil over compressed gas.

Passenger-Carrying Vehicles.

The single-decker omnibus covering large daily mileages upon services where the vehicle cylinders can be recharged two to three times per day constitutes one of the most favourable cases for compressed gas propulsion. The cost per equivalent gallon for both compressed gas and heavy oil propulsion are given for two such cases in Table III.

TABLE III.—*Single-Decker Omnibuses—Costs per Equivalent Gallon for Compressed Gas and Heavy Oil Propulsion.*

Type.	Annual Mileage.	Miles per Gallon.		Costs per Equivalent Gallon (Pence).			
				Compressed Gas.		Heavy Oil.	
		Petrol.	Heavy Oil.	Vehicle Equipment Charges.	Total.*	Additional Capital Charges.	Total.
32-seater .	40,000	7	15	1·19	9·14	2·18	7·78
32-seater .	56,000	8	16	1·08	9·03	1·78	7·78

* These totals are based on gas to vehicle at 2s. 6d. per 1,000 cu.ft. (7 95d. per equivalent gallon). To obtain corresponding figures at 3s. per 1,000 cu.ft. add 1·59d.

TABLE II.—*Goods Vehicles—Costs per Equivalent Gallon for Compressed Gas and Heavy Oil Propulsion (in Pence).*

Class in Tons.	8,000 Miles per Annum.					12,000 Miles per Annum.			
	Additional Licence Duties on Gas.	Additional Vehicle Equipment Charges.		Total in Pence per Equivalent Gallon.		Additional Licence Duties on Gas.	Additional Vehicle Equipment Charges.	Total in Pence per Equivalent Gallon.	
		Gas.	Heavy Oil.	Gas.*	Heavy Oil.		Gas.	Heavy Oil.	Gas.*	Heavy Oil.
1	..	5·10	..	13·05	..	..	3·40	..	11·35	..
1½	1·57	4·47	..	13·99	..	1·05	3·50	.	12·50	..
2	..	3·83	4·47	11·78	10·47	..	3·00	2·98	10·95	8·98
3	..	3·50	3·15	11·45	9·15	..	3·02	2·10	10·97	8·10
4	3·24	3·10	5·16	14·29	10·61	2·16	2·60	3·44	12·71	8·89
5	..	2·86	4·77	10·81	10·22	..	2·40	3·18	10·35	8·63
5	3·00	2·86	4·77	13·81	10·22	2·00	2·40	3·18	12·35	8·63

* These totals are for compressed gas to vehicle at 2s. 6 l. per 1,000 cu.ft. (7 95d. per equivalent gallon To obtain corresponding totals for gas at 3s. per 1,000 cu ft. add 1 59d.

They are based upon the operating conditions of fleets in actual service. The detailed calculations for one of these cases are given in Appendix II.

Table III. suggests that while compressed gas can show a considerable saving over petrol it cannot compete with heavy oil for a service of this type under present conditions.

Influence of Future Alterations in Fuel Prices, &c.

It would appear from the foregoing analysis that compressed gas cannot compete with heavy oil as a fuel for road transport services under present conditions. There are, however, several possibilities which might alter the present situation to the advantage of compressed gas, namely:

(1) An increase in the price of heavy oil.
(2) An allowance in respect of the weight of vehicle storage cylinders when assessing licence duties.
(3) The development of a satisfactory method of enriching coal or coke oven gas.
(4) The development of a special engine for compressed gas propulsion. The two latter possibilities will be discussed later.

An increase in the price of heavy oil would appear by no means improbable in view of the rapidly increasing use of the heavy-oil engine. At the same time it is important to note that for the same reason some reduction may be expected in the present additional first cost of such engines, a possibility which would be to the disadvantage of compressed gas.

In order to study the probable effect of these two factors, four cases, in which no additional licence duties are incurred, were taken from Tables II. and III. and calculations were made of the price to which heavy oil would have to rise before compressed gas could become economic: (*a*) with the present cost of heavy-oil engines and (*b*) with the present additional cost of such engines reduced by one-half. The results are shown in Tables IV. and V.

TABLE IV.—*Price which Heavy Oil Must Exceed Before Compressed Gas Becomes Economic for Goods Vehicles.*

[In Pence per Gallon.]

Class in Tons.	Price of Compressed Gas per 1,000 Cu.Ft.	With Present Additional Cost of Heavy Oil Engine.		With Present Additional Cost of Oil Engine Reduced by 50%.	
		8,000 Miles per Annum.	12,000 Miles per Annum.	8,000 Miles per Annum.	12,000 Miles per Annum.
	s. d.				
2	2 6	14·62	15·94	19·09	18·92
	3 0	17·8	19·12	22·27	22·10
5	2 6	13·30	15·78	18·55	19·28
	3 0	16·80	19·25	22·05	22·78

TABLE V.—*Price which Heavy Oil Must Exceed Before Compressed Gas Becomes Economic for Single Decker Omnibuses.*

[Pence per Gallon.]

Type.	Annual Mileage.	Price of Compressed Gas per 1,000 Cu Ft.	Price of Heavy Oil in Pence per Gallon.	
			With Present Cost of Heavy Oil Engine.	With Additional Cost Reduced by One-Half.
		s. d.		
32-seater .	40,000	2 6	14·92	17·25
		3 0	18·33	20·66
32-seater .	56,000	2 6	14·50	16·28
		3 0	17·68	19·46

Tables IV. and V. show that—

(1) In favourable circumstances—*i.e.*, where no additional licence duties are incurred and where compressed gas can be supplied to the vehicle at 2s. 6d. per 1,000 cu.ft.—there would have to be a rise of some 1½d. to 4d. per gallon in the price of heavy oil before compressed gas could become economic for goods-carrying vehicles under present conditions.
(2) If the present additional cost of the heavy-oil engine should be halved, then the price of heavy oil would have to rise some 7d. to 10d. per gallon before compressed gas could compete with heavy oil for goods-carrying vehicles.
(3) A rise in the price of heavy oil of 2½d. to 3d. per gallon would at present render compressed gas economic in certain favourable cases of passenger-carrying vehicles. Should the additional cost of the heavy-oil engine be reduced by 50%, then the price of heavy oil would have to rise some 4d. to 5d. per gallon before compressed gas could compete with the heavy-oil engine.

Enrichment of Coal Gas.

The development of a cheap and satisfactory means of enriching coal or coke oven gas would have a very important influence on its use for road transport. In the first place, it would extend the number of vehicles to which the system could be applied, and, in the second place, it would effect a material reduction in compression and storage charges.

There would appear to be three possible methods of enriching coal gas—viz.:

(1) By catalytic conversion of the carbon monoxide and hydrogen constituents into methane.
(2) By the employment of gas of high calorific value such as that produced in certain types of low-temperature carbonization plant.
(3) By the addition of creosote or low-temperature tar oil to the gas as it passes on its way to the engine.

The first method has been the subject of experiment by Dr. Graham, of the Mining Research Laboratory, Birmingham. So far as the author is aware, the results of these experiments have not yet been made public. It may be permissible, however, to entertain a few general comments on this method. It is reasonable to suppose that the cost of the process will, to a large extent, nullify the savings on compression and storage, but, even so, there would still remain the very substantial advantage of an increased radius of action. The chief difficulty would seem to lie in the provision of the units for catalysis of the gas at the charging stations. The development of compressed gas propulsion on anything like a large scale would necessitate charging stations at places other than gas-works and in their case the provision of units for catalysis of the gas would, considering all the associated difficulties, appear impracticable. The scheme would therefore appear to be of limited application.

The second alternative—namely, the use of gas of high calorific value from certain types of low-temperature carbonization plant—would be promising if there were any likelihood of such plants being erected in large numbers. There are, however, no indications at present that such is likely to be the case.

The possibilities of the third method may to some extent be assessed in the light of experience since a considerable amount of work has been carried out in this country on the use of tar oils in petrol engines. Among the difficulties encountered with this fuel are: (1) Sludging of the lubricating oil; (2) crankcase dilution; (3) increased wear of engine parts; (4) gumming of valves, piston rings, &c., and (5) excessive carbon deposits. In addition some loss of power is to be expected in view of the heat which must be supplied to vaporize the oil. There is also the drawback that for vehicles engaged on collection and delivery work the stops and starts are so frequent as to make the satisfactory working of the necessary vaporizing device a matter of great difficulty. It is highly significant that the Belfast Omnibus Company, after using 72,000 gallons of tar distillates in 28 omnibuses over a period of two years, have reached the conclusion that their experience is unfavourable and have discontinued the use of this fuel. With these facts in mind it is difficult to visualize the successful employment of tar oils in conjunction with coal gas.

The Development of a Special Engine for Compressed Gas.

Dr. Walter, of the Birmingham Gas Department, has put forward the suggestion that a special type of engine should be developed for use with compressed gas. The ordinary petrol engine has, under a low load factor obtaining under road conditions, a brake thermal efficiency of the order of 13 to 17% as compared with 24 to 30% in the case of the heavy-oil engine. The chief reasons for this are (1) the lower compression ratio employed, and (2) the nature of the cycles used are such that the brake thermal efficiency falls off more rapidly with decrease in load than in the case of the heavy-oil engine.

Dr. Walter suggests the use of compressed gas with a constant quantity, variable quality cycle similar to that employed in the heavy-oil engine—that is to say, one in which the quantity of air taken in for stroke is constant, variation of power being obtained by variation of mixture strength. The characteristics of coal gas are such that a wide range of power output may be obtained by this means (in contradistinction to petrol, which can only be used over a comparatively narrow range of mixture strength). Experience suggests that a compression ratio of 8 or 9:1 might safely be used. It is considered that such an engine

should show a saving in fuel consumption of about 40% which would have the double effect of reducing fuel costs and increasing the possible radius of action.

It is impossible to say without definite experiment whether such an engine could be successfully developed, but the known facts regarding the behaviour of coal gas in engines are such as to support the belief that an engine of this type is a distinct possibility.

Assuming that such an engine could be developed and that the anticipated saving in fuel consumption was realized, it is interesting to consider the influence it would have on the economic possibilities of compressed gas.

The cost per equivalent gallon of the initial cost of the gas and the additional capital charges on compression, storage, and vehicle equipment would be reduced by about 40%. The first cost of the special engine would, however, in all probability be greater than that of the petrol engine—at any rate, until such engines were produced in large quantities. There would, therefore, be an additional capital charge to take into account. Let us assume that the additional first cost of the special engine would be one-half that incurred at present with the heavy-oil engine and consider the total costs per equivalent gallon for compressed gas and heavy oil respectively (*a*) with the present cost of the heavy-oil engine and (*b*) with a reduction in the additional cost of the heavy-oil engine of 50%. It will be assumed that the cost of compressed gas to the vehicle is 2s. 6d. per 1,000 cu.ft. and that no additional licence duties are incurred on conversion. Table VI. shows the relevant figures for four cases taken from Tables II. and III.

TABLE VI.—*Influence of Special Engine.*

Class.	Annual Mileage.	Costs per Equivalent Gallon in Pence.			
		Compressed Gas.		Heavy Oil.	
		Existing Engines.	Special Engine.	With Present Cost of Heavy-Oil Engine.	Additional Cost of Oil Engine Reduced by 50%.
1-ton goods . .	10,000	12·03	9·13*	..	..
2-ton goods . .	10,000	11·55	8·72	9·58	7·79
5-ton goods . .	10,000	10·54	8·23	9·27	7·36
32-seater omnibus	40,000	9·14	6·59	7·78	6·69
32-seater omnibus.	40,000	9·03	6·31	7·78	6·89

* This figure based on additional cost of special engine of £50.

Table VI. shows that the development of a special engine capable of realizing the estimated savings in fuel costs and of which the first cost was midway between that of the present petrol and diesel engine respectively, would render compressed gas economic in many cases of goods and passenger-carrying vehicles under present conditions. Should the present additional cost of the heavy-oil engine be reduced to any marked extent then the field for the special engine would be reduced to exceptionally favourable cases such as lorries of less than 2 tons for which class diesel engines are not yet available, and single-decker omnibuses covering large annual mileages on routes where recharging two to three times per day is practicable.

Summary.

The system of compressed gas propulsion at present in use in this country has been described and an analysis has been made of its economic possibilities in competition with petrol and heavy oil. The conclusions to be drawn from this analysis are that:

(1) The compression ignition engine using heavy oil constitutes the real competitor to compressed gas.
(2) Under present conditions compressed gas cannot compete with heavy oil as a fuel for road transport services.

The influence which a rise in the price of heavy oil, an allowance in respect of the weight of vehicle cylinders when assessing licence duties, and a reduction in the present additional cost of the heavy-oil engine might have upon the economic possibilities of compressed gas have been examined.

Two further means of improving the economic possibilities of compressed gas have been examined—namely, the enrichment of coal gas and the development of a special engine for use with compressed gas. An attempt has been made to find under what conditions the special engine would render compressed gas capable of competing with heavy oil.

APPENDIX I.—*Costs per Equivalent Gallon for 4-Ton Lorry.*

A.—COMPRESSED GAS PROPULSION.

Gas:

Assume (1) cost of gas, compressed, stored, and delivered to vehicle at 2s. 6d. per 1,000 cu.ft.
(2) Calorific value of 475 B.Th.U. per cu.ft.

Then, since 265 cu ft. of such gas are equivalent to 1 gallon of petrol,

$$\text{Cost per equivalent gallon} = 30 \times \frac{265}{1{,}000} = 7{\cdot}95\text{d.}$$

Vehicle Equipment:

On the basis of 8,000 miles per annum and 281 full working days per annum the average daily mileage is 28·5. Allowing a margin for contingencies, five 350 cu.ft cylinders would be required, giving a radius of action of 35·6 miles.

Capital Cost.

Five 350 cu ft. cylinders at £10·5	£52·5
One mixer	5·0
One governor	15·0
Valves and fittings	11·0
Labour	20·0
Total	£103·5

Annual Charges.

Interest at 5%	£5·175
Renewal of cylinders, 5 years' life, 4% sinking fund, *less* 10% residual value	8·730
Renewal of remainder, 10 years' life, 4% sinking fund, *less* 1% residual value	4·205
Cylinder testing at 4s. each	1·000
Total	£19·110

$$\text{Annual petrol consumption} = \frac{8{,}000}{5{\cdot}4} = 1{,}480 \text{ gallons.}$$

$$\text{Cost per equivalent gallon} = \frac{19{\cdot}11 \times 240}{1{,}480} = 3{\cdot}10\text{d.}$$

Additional Licence Duties:

Additional licence duty incurred by conversion = £20.

$$\text{Cost per equivalent gallon} = \frac{20 \times 240}{1{,}480} = 3{\cdot}24\text{d.}$$

B.—HEAVY-OIL PROPULSION.

Fuel:

Petrol . . . . . 5·4 miles per gallon
Heavy oil . . . . . 11·9 " " "

$$\therefore \text{Cost per equivalent gallon} = 12{\cdot}0 \times \frac{5{\cdot}4}{11{\cdot}9} = 5{\cdot}45\text{d.}$$

Additional Capital Charges:

The additional capital outlay on the heavy-oil engine would be £240.

Annual Charges.

Interest at 5%	£12·0
Renewal, 10 years' life, 4% sinking fund, less 1% residual value	19·8
Total	£31·8

$$\text{Cost per equivalent gallon} = \frac{31{\cdot}8 \times 240}{1{,}480} = 5{\cdot}16\text{d.}$$

APPENDIX II.—*Cost per Equivalent Gallon for 32-Seater Omnibus.*

A.—COMPRESSED GAS PROPULSION.

Gas:

At 2s. 6d. per 1,000 cu.ft.
Cost per equivalent gallon = 7·95d. (see Appendix I.).

Vehicle Equipment:

On the basis of 40,000 miles and 350 working days per annum, the daily mileage would be 114. Assuming recharging twice per day, it would be necessary to provide seven 350 cu.ft. cylinders giving a radius of action of 65 miles. The capital cost would then be £124·5 (*cf.* Appendix I.).

Annual Charges.

Interest at 5%	£6·22
Renewal, 5 years' life, 4% sinking fund, less 10% residual value	20·70
Cylinder testing at 4s. each	1·40
Total	£28·32

$$\text{Annual consumption of petrol} = \frac{40{,}000}{7} = 5\,714 \text{ gallons.}$$

$$\text{Cost per equivalent gallon} = \frac{28{\cdot}32 \times 240}{5{,}714} = 1{\cdot}19\text{d.}$$

B.—HEAVY-OIL PROPULSION.

Fuel:

Miles per gallon on petrol . . . . = 7·0
Miles per gallon on heavy oil. . . . = 15·0

$$\text{Cost per equivalent gallon} = 12{\cdot}0 \times \frac{7}{15} = 5{\cdot}60\text{d}$$

Additional Capital Charges:

The additional capital outlay on the heavy-oil engine would be £240.

Annual Charges.

Interest at 5%	£12·00
Renewal, 5 years' life, 4% sinking fund, less 10% residual value	39·90
Total	£51·90

$$\text{Cost per equivalent gallon} = \frac{51{\cdot}9 \times 240}{5{,}714} = 2{\cdot}18\text{d.}$$

PRACTICAL ASPECTS OF
Instantaneous Water Heating by Gas

by
LEOPOLD FRIEDMAN,
Chief Engineer, Technical Department,
Ascot Gas Water Heaters, Ltd.

From a Paper read before the London and Southern District Junior Gas Association on Dec. 13, in which the Author makes particular reference to the essential requirements to be observed in the design and construction of this class of heater.

(*Continued from p. 43 of last week's issue.*)

Oxidation.

The direct oxidation of the metals used for the combustion chamber of a gas water heater is mitigated by keeping the temperature of the combustion chamber and heat exchanger at a figure below that at which rapid oxidation can occur. In the original method of construction solder was employed for joining the fins to the water tubes. This method would be satisfactory if one could depend on accurate regulation of the gas rate. Experience, however, has shown that this is too much to expect, and it has been found in some instances that the solder melted, causing inefficient heat transfer and upsetting the temperature gradient. The temperature of the fins increased above the melting point of lead and solder, and rapid oxidation and corrosion occurred. To avoid this, the fins are now brazed to the walls of the water-ways, and as the melting point of the brazing spelter is approximately 860° C., this difficulty has been successfully overcome.

Another factor which may upset the temperature gradient of the fins is the formation of scale, the removal of which is very important in view of what has been said concerning oxidation and corrosion. As has been stated, the fins must be so designed as to have a maximum temperature well below that of the melting point of lead, which is 327° C. With regular maintenance and a correctly regulated gas appliance, there is no reason why the rate of destruction due to oxidation and corrosion should not be extremely slow, and under these conditions an appliance should have a life of some fifteen years, but it is impossible for the designer to specify the exact life of the appliance owing to the varying conditions found on the district.

Combustion.

The combustion standard as specified by a large British gas undertaking is that the CO/CO_2 ratio should not exceed 0·01 for ungoverned appliances for 100% overload in gas pressure and 50% gas pressure overload for governed appliances. These figures correspond closely to those adopted by some manufacturers of gas water heaters, which are: At 25% overload, corresponding approximately to 50% pressure overload, the CO content of the undiluted dry flue gases should not exceed 0·05% and must in no circumstances (*e.g.*, back draught or static conditions in the flue) exceed 0·1%. Similarly the CO_2 content must not exceed 0·85 of that theoretically possible for the given test gas. In considering the combustion behaviour of gas water heaters, the following definitions of output may be adopted:

(1) *Normal Output* for which the appliance is designed for normal operation.
(2) *Limiting Output* 25% above normal output corresponding to a gas pressure overload of approximately 50%.

Unlike appliances using solid and liquid fuels, a gas appliance does not require the use of a draught-producing chimney for complete combustion. In fact, research has led to the design and manufacture of a gas water heater in which the volume of air for combustion is kept constant and is practically unaffected by varying flue conditions. Such a gas water heater must possess the following properties:

(1) Sufficient up-draught must be produced in the combustion chamber to supply the air necessary for complete combustion.
(2) In the event of excessive up-draught in the flue the excess air should not be drawn through the combustion chamber.
(3) In the event of temporary static conditions in the flue, the removal of the products of combustion from the combustion chamber must not be impeded.
(4) In the event of back-draught, the incoming air must be effectively diverted to prevent it from entering the combustion chamber.

To ensure these results, the following components must be incorporated in the heater:

(1) A draught interrupter.
(2) A back-draught diverter.
(3) A static pressure diverter.

A draught diverter embodying these three features is illustrated in fig. 13.

Draught Diverter, Characteristic Curves.

Exhaustive tests have been made with the draught diverter and characteristic curves showing the CO_2 and CO contents of the flue gases (measured immediately above the heat exchanger) are plotted in relation to draught, back draught, and static conditions. The draught was varied by connecting different lengths of vertical flue pipe to the draught diverter. Back draught was produced by means of a variable speed fan. The flue pipe had the same diameter as the flue socket of the appliance. Static conditions

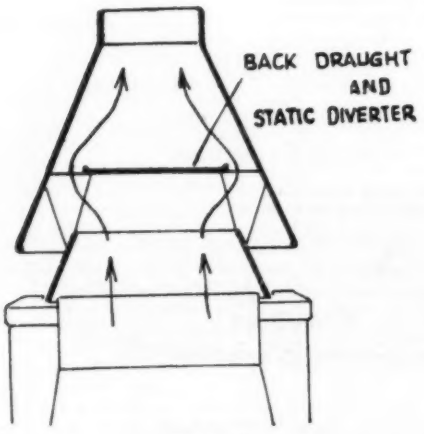


Fig. 13.

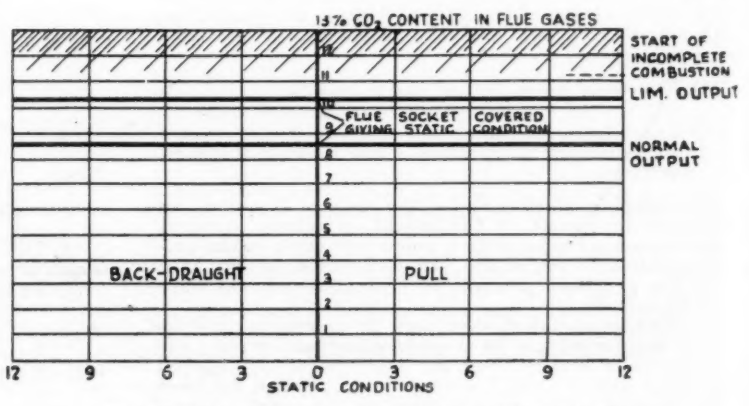


Fig. 14.

were produced by covering up the flue socket of the appliance.

The appliance is ideal when the graph giving the CO_2 contents for 1·25 times the rated output is horizontal (fig. 14), and does not touch the area of incomplete combustion at any point; this is indicated by the shaded area in the diagram. The limits of the shaded area indicating incomplete combustion are, of course, dependent on the chemical composition of the test gas. In practice, with the CO_2 content 0·85 times that theoretically possible, the formation of CO begins to increase rapidly, and it was for this reason that 11% was taken as the limit for complete combustion with the particular test gas. It should be insisted that the appliance should give perfect combustion when regulated to the *limiting* output specified for all possible conditions in the flue.

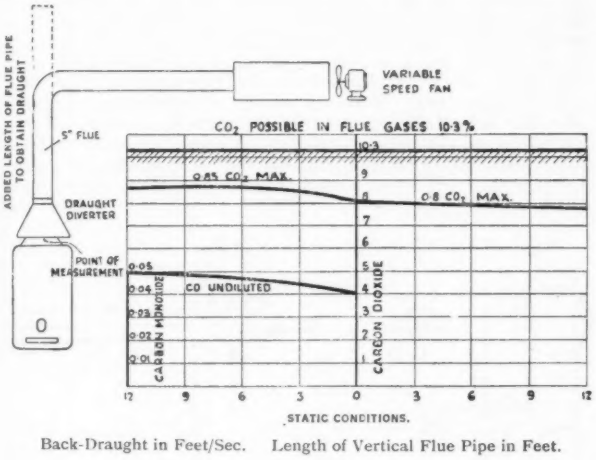


Fig. 15.

Fig. 15 shows a curve for a satisfactory draught diverter, from which it can be seen that the CO content at the limiting output does not exceed the specified limit under any conditions, and that the CO_2 curve does not approach the region of incomplete combustion at any point.

Thermal Characteristic Curves.

Fig. 16 shows sets of thermal characteristic curves taken for two types of appliance. It will be noted that the CO/CO_2 ratios are well below the standards specified, the efficiency curves are practically flat, and the temperature of the flue gases is well below the charring temperature of wood.

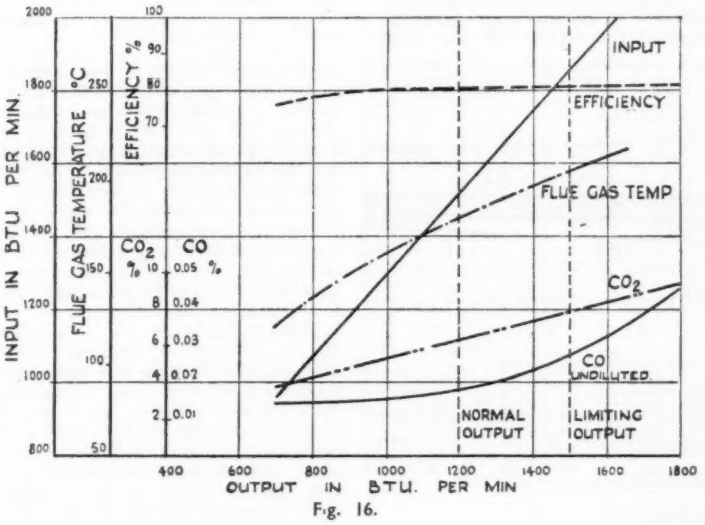


Fig. 16.

New Features.

The demand for completely automatic operation of water heaters has given rise to the development of several new automatic control and safety devices. Among these are:

(1) Gas governors.
(2) Temperature controls.
(3) Back draught safety devices.

Gas Governors.

The need for maintaining a constant gas rate to the gas burner is becoming realized by manufacturers of gas water heaters and gas undertakings alike. Although gas water heaters are provided with means for regulating the gas rate to the burner, the device is not automatic and the gas rate cannot be maintained constant with a varying gas pressure, and consequently there is a possibility of overloading, which may lead to the formation of CO.

As has already been stated, the combustion chamber is designed to draw in sufficient excess air to allow for increased gas rate, but this necessitates a larger combustion chamber than is required with a governed supply. This is indicated by the standards of one of the largest gas companies, which requires satisfactory combustion at 100% pressure overload for ungoverned appliances and 50% pressure overload for governed appliances. The margin cannot be entirely dispensed with, as the combustion standard in gas appliances is not always maintained owing to the formation of deposits in the flue-ways, &c.

Even on premises where service governors are fitted, it is preferable to instal appliance governors on account of the possible variations due to original carcassing and the addition of fresh appliances thereto.

A form of constant volume governor which has been developed for use with gas water heaters is illustrated in fig. 17. Its construction is as follows:

The gas section, gas valve, pilot cock, main gas cock, and volume governor are incorporated in one unit. The float tube (10), with the float housing (11), is screwed to the housing cover. The float (12) slides up the float tube.

A by-pass channel is shown by (13) and is controlled by an adjustable throttle bolt (16). Adjustment is effected by removable bushes of different gauges held by a split pin.

When the gas tap is opened the gas flows through the hollow plug, up under the float (12), then round the float through the annular space between the edge of the float and the inside of the float housing (11), then through the triangular outlet ports in the float tube (10) to the burner.

Until the full volume of gas has been reached the float is ineffective, and it only rises slightly in consequence of the pressure difference which is produced by the deflection of the gas flow. When this has been exceeded, however, the float rises and restricts the triangular ports until the product of the pressure difference between the two sides of the float and the area of the horizontal ring of the float is equal to the weight of the float.

When this has been reached, a state of equilibrium will obtain and the governor will pass a constant volume of gas. The adjustment of the by-pass channel for gases of various calorific values and densities is effected by the number of bushes mounted on the throttle bolt placed in the by-pass channel. It will be noticed that any gas passing through the by-pass channel leaves the governor by the same path as the gas passing under the float, and affects the pressure on the float, thereby ensuring that no ungoverned gas passes to the burner.

Curve 2, fig. 18, shows the average operation for five constant volume gas governors using 500 B.Th.U. gas of 0·467 specific gravity (air = 1).

The volume of gas passed by the governor departs slightly from the theoretical constant as the pressure rises. This is due to the construction of the governor, but the range of

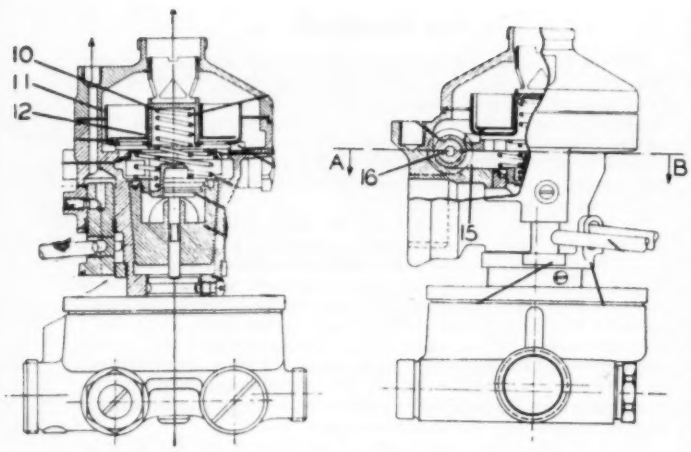


Fig. 17.

variation does not exceed ± 5%. With this type of governor, provided the calorific value and specific gravity of the gas are known by the makers, all the necessary adjustments for local conditions can be effected at the works before despatch. This must prove a great convenience to gas undertakings, with a consequent saving in labour, as no regulation of the gas supply is necessary when the heater is being installed.

The following advantages are gained by fitting this type of governor on an instantaneous gas water heater:

A. Protection of the appliance from overloading.
B. The human element in regulation is eliminated.
C. One moving part only is used. This is made of metal which will not corrode.
D. Variations due to changes in the area of the burner orifices or to temperature have no effect on the output of the appliance. It is also possible to change to a burner with larger orifices for use with gas of lower pressure.
E. If desired, existing installations can easily be converted to include volume governors by a simple exchange of parts. The only attention these governors will require will be washing with trichlorethylene at long intervals, depending on the quality of the gas.

Temperature Control.

Temperature control can be obtained automatically by the use of thermostatic regulation of the gas valve to give a constant outlet temperature of the water, or manually

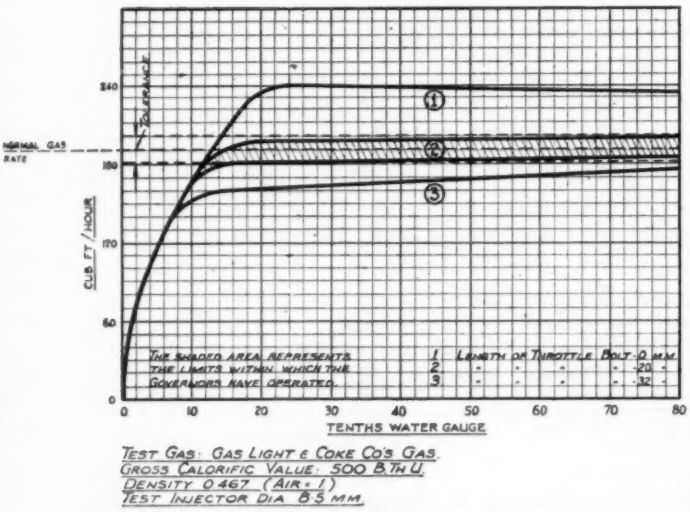

TOLERANCE
NORMAL GAS RATE
CUB FT / HOUR
TENTHS WATER GAUGE
THE SHADED AREA REPRESENTS THE LIMITS WITHIN WHICH THE GOVERNORS HAVE OPERATED.
1 Length of Throttle Bolt 0 m.m.
2 " 20 "
3 " 32 "
TEST GAS: GAS LIGHT & COKE CO'S GAS.
GROSS CALORIFIC VALUE: 500 B.TH.U.
DENSITY 0.467 (AIR = 1)
TEST INJECTOR DIA 8.5 MM.

Fig. 18.

The normal gas rate figure is 1,600 B.Th.U /minute.
The length of the throttle bolt should be 20 m m.

by incorporating a graduated control, together with a water pressure governor in the heater.

The type of automatic control employing a pilot flame as a control flame is illustrated in fig. 19. Its operation is as follows:

A.—Thermostatic gas valve controlling the supply of gas to the main burner. B.—Pilot safety device and control flame. C.—Thermostatically controlled by-pass gas valve. E.—Automatic valve controlled by flow of water in pipe 40. F.—Starter valve.

When the water is flowing through pipe 40, the automatic valve (E) operates and allows gas to flow through by-pass tube (22) and the thermostatically controlled valve (C) to the control flame orifice (19). The control flame impinges on the bi-metallic disc (15), which bulges on being heated and allows gas to pass to the main burner. When the water has reached the desired temperature the thermostat comes into operation and throttles the gas flowing through the valve (C), thereby decreasing the control flame and cooling the bi-metallic disc (15) and throttling the supply of gas to the burner. By these means a constant outlet temperature is obtained. On the water being turned off, the automatic valve (E) shuts off the supply of gas to the control flame, thereby reducing its length and cooling the bi-metallic disc (15), which contracts and interrupts the supply of gas to the main burner. Sufficient gas to keep an ignition flame alight is allowed to pass through the pipe (44) and throttle (45). If this flame is extinguished accidentally the bi-metallic disc (18) contracts and shuts off the supply of gas to the pilot flame. An ignition switch (F) is fitted which, when depressed, allows gas to by-pass the pilot safety device. To counteract sudden variations in gas pressure, a throttling device, consisting of a flexible plate (53),

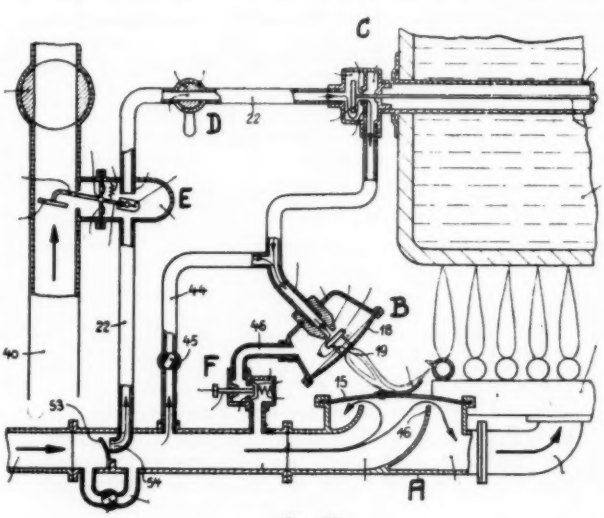


Fig. 19.

projects into the main gas current and is more or less near to the inlet (54) of the controlling gas pipe (22), according to the strength of the gas current. By the throttling of the control gas thus obtained, the length of the control flame is varied. A hand switch (D) is provided and serves for the voluntary shutting off of the appliance. Various arrangements can be made to ensure quick closing of the gas valve (A) once the water flow has been interrupted. This can be ensured in one way by having the bi-metallic disc (15) of such dimensions as to dissipate quickly the heat in the event of the control flame being shortened and returned to the closed position. The cold gas passing under it will aid this operation.

Manual control of the temperature of the hot water can also be effected on some gas water heaters by the use of a graduated throttle in conjunction with a water governor. Variations in the inlet temperature are compensated for by a thermostatically controlled water throttle. As it is very often desirable to vary the outlet temperature when using an instantaneous gas water heater, I feel that constant temperature controls are an unnecessary complication, and that no market for them exists in England.

To ensure complete safety and to facilitate installation, manufacturers of gas water heaters have to design their appliances so that combustion is independent of the influences of unsuitable flues and chimneys. The two conditions that are undesirable in the flue are:

(1) Static conditions.
(2) Back draught.

Static conditions exist when the contents of the flue pipe or chimney are in a state of equilibrium. Static conditions are due to:

(1) Unfavourable temperature conditions.
(2) Badly designed chimneys or flue pipes.
(3) Chimney or flue pipe blocked.

Unfavourable temperature conditions occur when there is no difference of temperature between the air inside and outside the chimney. These conditions often obtain in cases of chimneys built in the outside walls, or when the weather turns cold. Similar conditions can also exist if a flue installation consisting of galvanized iron flue pipes passes through cold rooms.

Temporary static conditions occur when chimneys and flue pipes are used intermittently. When the gas appliance is first put into operation under such conditions the flue gases will not ascend the chimney or flue pipe until the air contents therein have been displaced by the hot flue gases.

Unfavourable chimney conditions exist when:

(*a*) The cross-sectional area of the chimney is incorrect or is reduced at some point.
(*b*) The chimney is partly blocked up.
(*c*) The direction of the flue pipes is frequently changed.
(*d*) Rough inside surfaces give rise to high surface resistance.

Back draught is produced by:

(*a*) Unfavourable temperature conditions.
(*b*) Unfavourable atmospheric conditions.

Unfavourable temperature conditions obtain when the air in the chimney or flue pipe is colder, and therefore heavier, than the outside air. This happens when the temperature of the outside air increases suddenly after several cold days. In these circumstances the air in the chimney may begin to move downwards until an equilibrium of temperature is reached.

Unfavourable atmospheric conditions are due to wind striking the terminal of the flue pipe or chimney, and steps must be taken to prevent this. Where the terminal is below the ridge of a neighbouring roof, very weak air currents will produce an increase of pressure sufficient to produce static conditions in the flue pipe. There are also cases where the wind may blow directly into the flue pipe, causing back draught.

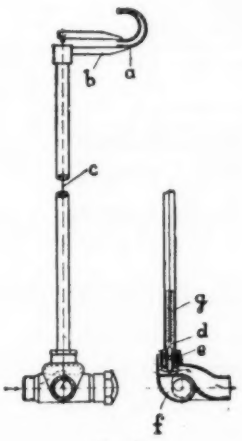


Fig. 20.

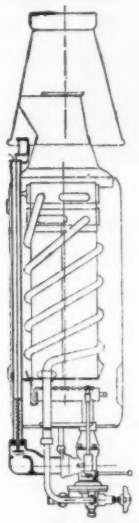


Fig. 21.

A back draught safety device developed recently consists of a bi-metal spring, one end of which is fixed and the other end is connected to a push rod, which transfers the movement of the bi-metal spring to the gas valve. In case of back draught, this bi-metal spring is warped by the hot flue gases and changes its shape, thus closing the gas valve. The amount of movement can be pre-determined by suitable design. When the back draught stops or increases sufficiently in velocity the bi-metal spring cools, thus again opening the gas supply to the burner.

The principle of this invention is illustrated in fig. 20. One end (*a*) of the bi-metal spring is fixed to part (*b*). The free end of the bi-metal spring is connected to the push rod (*c*), which is in turn fixed to a gas valve stem (*d*). The gas-tight sleeve (*e*) prevents any leakage of gas from the gas housing (*f*). The spring (*g*) keeps the gas valve on its seating should anybody interfere with the bi-metal spring, either damaging it or removing it altogether. Fig. 21 shows the back draught safety device incorporated in an instantaneous gas water heater.

The bi-metal spring is located in the draught diverter in such a way that, should back draught or static conditions occur, the warm flue gases strike it. If the back draught persists for longer than approximately 2½ to 3 minutes (this length of time may be varied to suit individual installations), the bi-metal spring will cut down the input to the burner to about 600 B.Th.U. per minute. When back draught or static conditions cease or static conditions increase sufficiently in velocity, the bi-metal spring will cool, opening the gas valve again, and the correct input is available within approximately 90 seconds.

Fig. 22 shows the behaviour of an instantaneous gas water heater under static conditions. The output of the instantaneous gas water heater, fitted with a back draught safety device, is 1,300 B.Th.U. per minute, the gas consumption 3·25 cu.ft. per minute, and the gross calorific value of the gas is 500 B.Th.U. per cu.ft. Curve (1) shows that in approximately 90 seconds the gas valve begins to close, resulting in a decreased burner pressure. In approximately 100 to 180 seconds the gas valve closes to its minimum position.

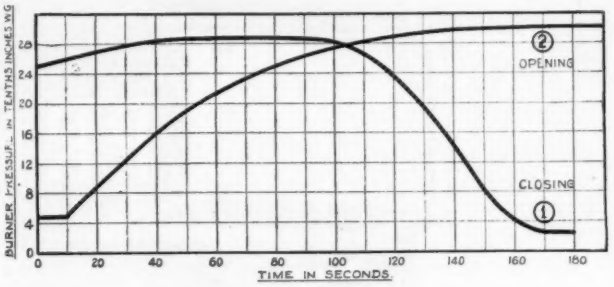


Fig. 22.

It is quite possible to reduce the time required to close the gas valve to its minimum position by changing the tension of the spring. This, however, is not advisable, as sometimes two or three minutes will be required to replace the cold air in the chimney by the hot gases, thus establishing a natural draught.

Curve 1 in fig. 22 also shows that the burner continues to burn with the flames reduced. This condition is desirable as, should static conditions be due to thermal influence, the possibility of starting a natural updraught by the gradual heating up of the air contents of the chimney must exist.

The gas consumption in the minimum position can be varied and need not exceed the consumption of small instantaneous gas water heaters, which are usually installed without flue pipes. Should, therefore, the static conditions persist for an indefinite period, no danger exists due to the flue gases entering the room. Lastly, it is desirable to keep a small flame burning to prevent too sudden ignition of the burner should static conditions cease and the gas valve open. However, it can be easily arranged for the gas valve to close entirely should static conditions prevail for a predetermined period. Curve 2 (fig. 22) shows the behaviour of a gas water heater fitted with a back draught safety device after static conditions have persisted for some time and then ceased. It can be seen that within approximately 90 seconds the appliance is burning the correct amount of gas for normal output.

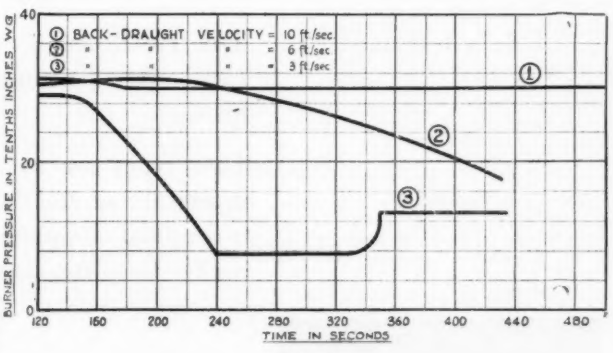


Fig. 23.

Other points to be considered with regard to the operation of a back draught safety device are:

(*a*) Should the back draught safety device operate in cases of slow back draught?
(*b*) How should the back draught safety device behave when the back draught exceeds a certain velocity?

These two conditions are quite different and require individual attention. If the back draught is of high velocity —*i.e.*, approximately 10 ft. per second—the safety device need not operate.

Curve 1 in fig. 23 shows the behaviour of the back draught

MAIN

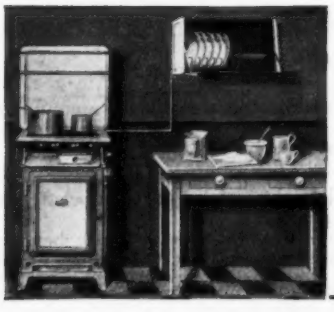
"P.R." HOT-CLOSET will ensure a warm service of Food.

THE "P.R." Hotcloset enables plates and other dishes to be warmed without interfering with the cooking of food on the hotplate or in the oven; cooked foods can be kept warm.

The Hotcloset is strongly constructed with cast-iron frame ends and sheet metal body. The exterior can be had in various enamel finishes, while the interior is finished in black vitreous enamel and contains a removable grid for accommodating the plates, etc.

The Hotcloset is heated by a luminous burner of very small gas consumption—costing only 1d. for 5 hours heating.

Two types are available, the Plate-Rack Fixing Type as shown above, and the Wall Fixing Type below. The former is supplied complete with cast-iron arms for fixing to the cooker hotplate, also backstrap and enamelled splash-plate.



Folders and further information upon application.

R. & A. MAIN LIMITED, LONDON AND FALKIRK

London Office and Showrooms: 48, Grosvenor Gardens, S.W.1. ● Glasgow Office and Showrooms: 82, Gordon Street

safety device under a back draught velocity of 10 ft. per second. The curve being practically parallel to the abscissa, shows that the back draught safety device does not operate, and this is not by accident but by design. The only point which had to be settled was the correct back draught velocity at which the safety device should operate. The important point to consider was that back draught occurs intermittently, and sometimes only for short periods, and that in such cases the safety device should not operate.

Curve 3 in fig. 23 shows the behaviour of an appliance fitted with a back draught safety device with a back draught velocity up to 3 ft. per second. In accordance with the curve, at a back draught velocity of 3 ft. per second, the back draught safety device begins to operate after 120 seconds have elapsed. After 240 seconds the gas valve has closed to its minimum position. Curve 2 shows operation with a back draught velocity of 6 ft. per second. It is not so steep, and throttling begins to take place somewhat later.

This back draught safety device may be employed not only for gas water heaters, but also for many other gas-fired appliances.

Other types of back draught safety devices are:

(1) One in which the waste gases issuing from the draught diverter are used to extinguish the pilot flame, which brings the pilot safety device into operation and cuts off the supply of gas to the main burner.

(2) One employing the hot gases issuing from the draught diverter to heat a thermo couple connected to a solenoid, which is made to close the gas valve on being energized.

Fig. 24 shows a back draught safety device of Type 1. In this case a tapping (43) is taken from the upper draught diverter down which the waste gases pass and impinge on the flame of the pilot safety device, which is extinguished and consequently shuts off the main supply. The disadvantage of this, however, is that the pilot jet has to be relighted before the appliance can be put into operation again.

Fig. 25 shows a thermo-electric type of back draught safety device and consists of a thermo-couple (8) placed under the draught diverter in the path of the waste gases. The hot junction of this is connected to the draught diverter and the cold junction to the winding of a solenoid, which is connected to the frame of the appliance, thereby completing the circuit. When the thermo-couple is heated it energizes the solenoid (12), which attracts the iron core (16) and throttles the supply of gas to the main burner. The operation curve of this can be made similar to that described above, as the throttling of the valve varies with the temperature of the thermo-couple.

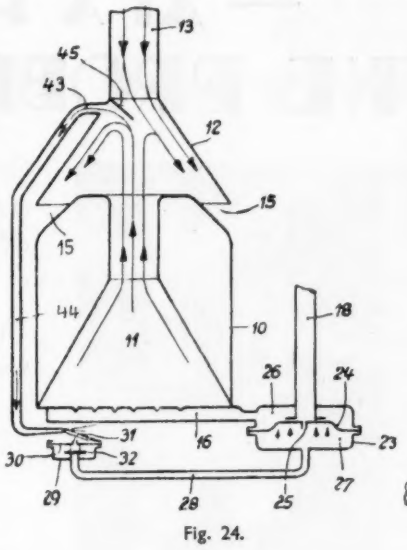


Fig. 24.

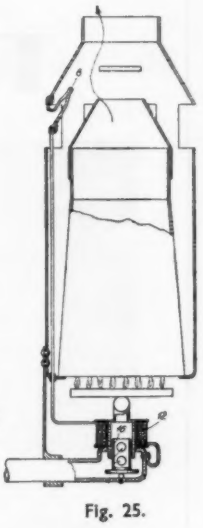


Fig. 25.

It is evident that there is a field for back draught safety devices, but it is questionable whether the additional safety is worth the erratic operation which their employment would give rise to, especially with the great number of faulty flue installations in existence.

(To be continued.)

Company Meeting

Cannon Iron Foundries, Ltd.

Prospectus Estimates Considerably Exceeded

The First Ordinary General Meeting of Cannon Iron Foundries, Ltd., was held on Dec. 31 last at the Grand Hotel, Birmingham, Sir FRANCIS H. PEPPER, J.P. (Chairman of Directors), presiding.

The CHAIRMAN, in moving the adoption of the report and accounts, said: Your Directors are pleased that at the first annual general meeting of the new Company they have the pleasure of presenting to you accounts showing profits for the year ended Sept. 30, 1935, of £66,412 15s. 9d., being more than £11,000 in excess of the average profits for the three years to Sept. 30, 1934, mentioned in the offer for sale of shares, which three years included the peak year.

The Company took over the business as from Oct. 1, 1934, but only the profits after March 20, 1935, are available for distribution as dividends to the shareholders of this Company.

The profits for the preceding period of the year, after deduction therefrom of a dividend of £7,013 paid on the vendor company's shares in accordance with the agreement for sale, leave to this Company the sum of £23,880 9s. 5d., which has been placed to capital reserve.

Dividend of 7½%.

The profits for the portion of the year from March 20, 1935, to Sept. 30, 1935, amounted to £35,519 10s. 4d., out of which dividends may be paid to the shareholders of this Company. After providing for income-tax thereon and dividends on preference shares at the rate of 5½% per annum to Sept. 30, 1935, there remained a balance of taxed profits available for distribution of £23,396 14s. 7d. Your Directors recommend that a dividend shall be paid on the ordinary shares of 7½% (less income-tax) for the period from March 20 to Sept. 30, 1935, which will absorb £14,531 5s., and leave to be carried forward to next year the sum of £8,865 9s. 7d. I believe this will be considered satisfactory by the shareholders.

A first dividend amounting to £1 0s. 10d.% gross was, in accordance with the promise in the offer for sale, paid on July 1 last on the preference shares for the period to June 30, 1935 (less income-tax), and a further half-year's dividend has now been declared on the preference shares, and if the recommendation made in the report of the Directors as to the dividend to be paid on the ordinary shares is approved by this meeting warrants for the dividends on both classes of shares will be dispatched to-day.

Balance-Sheet Items.

To turn to the balance-sheet, you will see that the liabilities, including reserve for taxation, amounted to £53,805, and that on the other side of the balance-sheet the floating assets appear as £202,743, being nearly four times the amount of the liabilities.

The goodwill appears in the balance-sheet at £206,006 3s. 2d. After deducting the £23,880 9s. 5d. carried to capital reserve, the net figure will be £182,125 13s. 9d., and therefore goodwill stands at a figure less than three times the past year's profits.

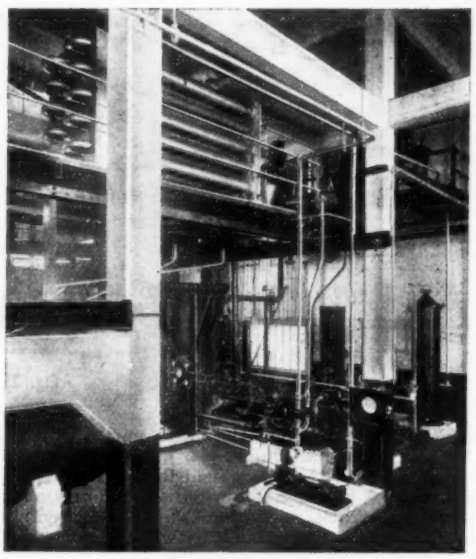
The business of the Company was established in 1826 as manufacturers of cast-iron hollow-ware, Porceliron sanitary ware, chemical plant, and general ironfoundry; but the manufacture of gas stoves was commenced over 40 years ago, and that branch grew steadily until it became the principal department. Although a juvenile department relative to the older business of the Company, the gas stove department is one of the oldest in the trade.

The management are constantly engaged in experimental and research work with the intention of retaining for the Company its unsurpassed position in the trade as manufacturers of goods of the highest quality, including inclined gas fires, gas cookers, and gas radiators.

The motion was seconded by Mr. R. TALBOT CLAYTON (Managing Director) and carried unanimously.

Sir Francis Pepper was re-elected a Director, and in reply expressed a hope that the shareholders would meet in circumstances as pleasant next year.

DISPOSAL OF GAS LIQUOR
— AT A PROFIT!
THE PROBLEM SOLVED.



Thorncliffe-Baldurie Plant at Bournemouth—
Capacity 150 tons of Liquor per day.

Concentration by the Thorncliffe-Baldurie process is a completely satisfactory solution to the hitherto difficult problem of the treatment and disposal of Gas Liquor.

This plant has been specially designed for the work and has these demonstrable advantages :—

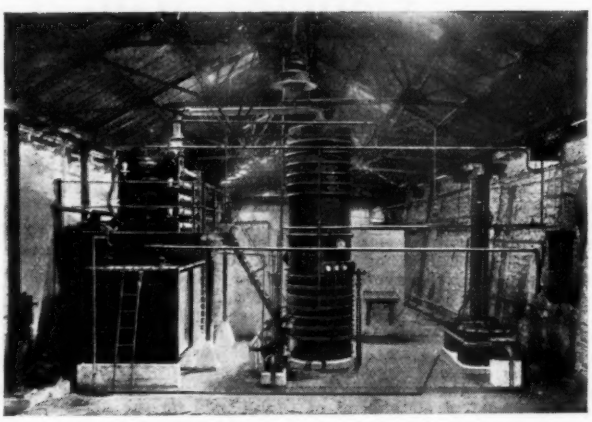
1. The liquor can be concentrated without expenditure of labour for plant operation.
2. This method turns a vexing problem into a trouble-free process.
3. It is remunerative, profit making.
4. The cost of the installation of the complete plant is relatively very low.

NOTE :—We make a speciality of converting existing sulphate of ammonia plants to this patent process, making provision for reversion to the manufacture of sulphate at very short notice.

Thorncliffe-Baldurie Concentration Plants are being rapidly installed in all parts of the country. Plants are already in operation in many places, including :—

CAMBRIDGE	GLASGOW (3 installations)
EDINBURGH	HASTINGS
BOURNEMOUTH	PLEAN
DEVONPORT	LEA BRIDGE
DUNFERMLINE	LEATHERHEAD
WATFORD	NORTH BERWICK
MOTHERWELL	BLACKBURN
STOCKPORT	SOUTH YORKSHIRE
WOKING	ETC., ETC.

We shall be glad to investigate YOUR problem and submit our proposals for your consideration.



Thorncliffe-Baldurie Plant at Devonport—
Capacity 60 tons of Liquor per day.

MANUFACTURED IN ENGLAND BY
NEWTON, CHAMBERS & CO., LTD.,
THORNCLIFFE IRON WORKS - - - - - - - - - NEAR SHEFFIELD.

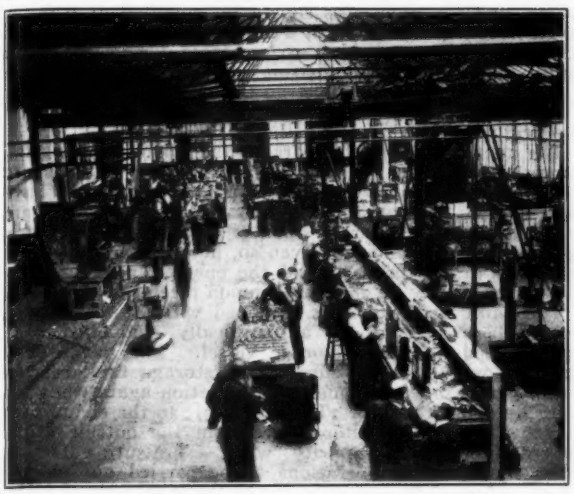
AND IN SCOTLAND AND NORTHERN ENGLAND BY
HENRY BALFOUR & CO., LTD.,
LEVEN, FIFE.

DICKSON

An Up-to-Date Factory for Gas Heating Appliances

Bratt Colbran's New Quarters at Wembley

An account of some of the principal operations carried on by Bratt Colbran, Ltd., in the well-equipped and commodious premises at Wembley, to which they have recently transferred the London section of their production activities.



General View of the Metal Shop.

Much has been heard in recent times of "Portcullis" products—just as a sound piece of apparatus, supported by good publicity, is always kept before the public eye. But little has been recorded on the subject of where and how they are produced.

This has been due not so much to modesty on the part of Messrs. Bratt Colbran, but to the fact that it is only comparatively recently that the firm have been able to "organize" their gas department to a degree which has enabled it to keep pace with this new and rapidly expanding side of their business. This has been accomplished by a general re-organization of methods, including the transfer of their London factory from Cricklewood to much more convenient and commodious premises at Wembley. This new factory we were enabled to inspect recently through the courtesy of Messrs. Bratt Colbran, and thus obtain an insight into the care and attention to detail given in the manufacture of all their products.

It should be made clear at the outset that by no means all production work is carried on at the Wembley Works, for all the heavy casting and foundry work is done at the firm's Belper factory near Derby, where a large proportion of the gas fires are also produced and tested and where there is a fully equipped laboratory for research. The operations carried on at Wembley are sufficiently representative, however, to give a full appreciation of all the processes involved.

The firm of Bratt Colbran have built up over a period of fifty years a considerable reputation as fireplace specialists, and are one of the very few firms who set out to produce a gas fire and fireplace in one complete and artistic unit. They have always paid particular attention to design, on the argument that the gas fire is not necessarily an appliance merely to be stood in front of an existing coal grate, but one which is capable of artistic treatment in combination with the fireplace as a whole and which should be as "permanent" as a solid fuel fire.

The Clerical Side.

In dealing with the various aspects of the works in natural rotation, it is necessary to trace the operations right through from the initial order. Upon the receipt of an order at the Mortimer Street Showrooms, all the particulars are entered under an appropriate index number, and fourteen copies are issued on a duplicating machine.

These copies constitute the complete records and instructions for every department, including works, showrooms, invoicing, despatch, sales representative, and all the production sections, thus forming not only a thoroughly reliable method of dealing with orders, but also a complete record of each individual transaction.

Each department receives its copy of the order whether that particular section is involved in the production or not, and by this means it is possible to keep a complete record of each job from start to finish under its index number. If the foreman of any department finds that he is not involved in any particular order, the copy of which passes through his hands, he simply scores through the sheet and files it in order of index number, so that in the event of an error there is a complete record of every order in every department. This system is simple and straightforward in operation and completely foolproof, while at the same time expediting the execution of orders and the maintenance of complete records of every transaction.

There is, in addition, a well equipped photographic department where catalogue and general publicity illustrations are produced. In connection with this department there is a special room, artistically decorated and furnished, where, under the intense light of four 1,500 c.p. lamps, set fireplaces are photographed in natural surroundings for publicity work.

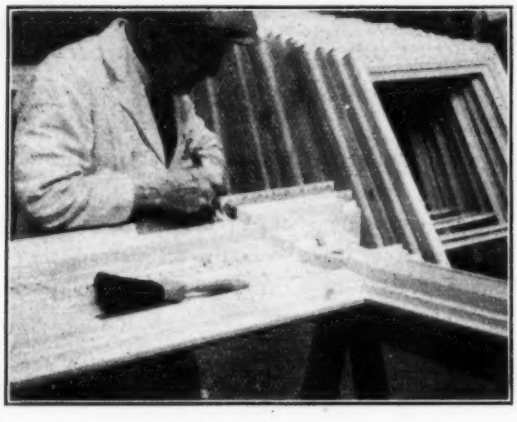
The Production Side.

Coming now to the works proper, one finds the same organized sequence of operations apparent in every department from the receipt of the raw materials to despatch or storage. At the present time the firm do not keep a great stock of finished articles on hand, for the obvious reason that almost all their goods are supplied to special order, involving not only varying details of design but also dif-

The Woodwork Shop.

ferent colour finishes. Therefore, most of the store rooms are occupied by what are known as " semi-finished " goods —that is to say, by the various component parts, all complete and ready for final assembly and painting, which can be carried out very promptly. It is the eventual aim, of course, to carry stocks of certain completed articles for which there is a more constant demand, but by reason of the nature of their work the present system is more advantageous at the moment.

The raw materials in the shape of steel sheets and mouldings are received into the raw material store, together with



Applying Mouldings to a Mantel.

various small fittings and castings which the firm find it more convenient to buy ready made in bulk than to set up special plant for producing such parts themselves. These include certain small burner castings for gas fires, including taps, springs injectors, &c., while the well-known radiants, the firebricks, and heavier castings for solid fuel grates are also brought in ready made.

The steel sheets are cut to the appropriate sizes on a guillotine machine and stamped out on large presses to the required shape, after which the components are welded up and polished ready for assembly.

A special order section, complete with a smithy, deals with the production of period designs of solid fuel grates according to plans drawn up at the Mortimer Street drawing office to customers' requirements, and some very beautiful work is turned out by this department. Another section produces the " Portcullis " convector heaters, which are completely assembled and finished in a grey undercoat before passing to the semi-finished store. Up-to-date polishing and scurfing plant is responsible for the bright metal finishes, all the machines being effectively vented so as to carry away the dust and filings through a duct to a cyclone extractor, thus maintaining a pure atmosphere for the operatives to work in.

In the gas fire assembly department all the component parts are fitted up, including the automatic ignition mechanism, the flint wheels for which are cut out on a high precision machine to a great degree of accuracy to enable the wheels to stand up satisfactorily to the hard wear to which they are subjected in use. The finished lighting mechanism is finally carefully tested in operation before fitting to the fires.

All tools for the various processes are manufactured at the factory, and a special department is maintained for this purpose. Each job is coded with the appropriate tool numbers required for its execution. It is thus known immediately an order comes through whether the necessary tools are available, and if not the firm are at once able to advise a customer that a proportionately longer time will be required to carry the job through. A promise of delivery is therefore not liable to be given when the necessary tools are not available in stock to do the work.

A 200 tons pressure stamping machine is at present in process of installation for stamping out steel fireplace frames, this being actuated by means of a self-contained motor and heavy flywheel operated by compressed air control. There are a large number of other presses for various stamping work in this department.

A New Panel Heater.

Work is just commencing on a new design of high-temperature radiant panel. This is an interesting appliance, which is designed for the warming of halls, churches, and similar buildings. It consists of a strip of luminous burners which heat a firebrick surface measuring 26 in. by 15 in., maintaining a temperature of about 640° F. The gas jets are controlled by a ¼-in. G.L.C. governor and operated by a Newbridge switch and by-pass, which is supplied with 12 ft. of stranded cable. The gas rate is stated to be 25 cu.ft. per hour at a pressure of 1 in. w.g., and a radiant efficiency of 40% is claimed. In the majority of cases the convected heat will also be usefully employed, giving an overall efficiency in the region of 90%. The whole is enclosed in a steel case fronted with three-sixteenths vitreous enamelled plate in a chromium-plated frame, and the apparatus should be mounted at 9 ft. or 10 ft. above floor level with 4 ft. or 5 ft. clearance below the ceiling. The radiating surface faces downwards at an angle of 45°, thus eliminating as far as possible the " roasting " of dust particles on the radiating surface.

Further details of this appliance will be announced by the firm when it is ready for the market.

The next process in the works is the colour-spraying department, where " Foochow " heat-resisting enamels are exclusively used on the various appliances. As we have said, articles are not stocked ready coloured, and they are taken through this process upon receipt of the customer's specification as to finish. Even so, however, by reason of the quick-drying properties of the enamel, a 24-hour delivery can usually be guaranteed upon receipt of the order.

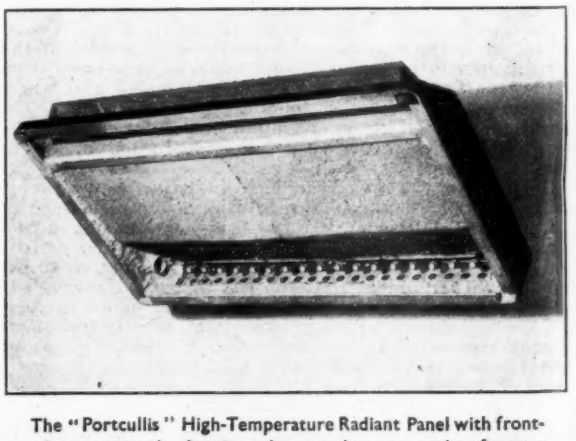
The paint spray room is equipped with eight spraying guns, operated from an automatically controlled compressor feeding into a storage vessel. This compressor cuts out when the pressure in the storage tank reaches 85 lb. per sq.in., and comes into operation again when the pressure drops to 70 lb. The air supply to the compressor is taken through a filter direct from the outside atmosphere, thus ensuring purity, while a pressure valve enables the spraying operations to be carried out at any pressure from 5 lb. per sq.in. up to the maximum of 85 lb. Here again, as in the polishing department, the products are effectively drawn away from the room. There are also eight spraying guns in the wood-painting department.

After painting, the metal products pass to the stoving ovens, of which there are three, heated by coal gas, and in these they are stoved for twenty minutes to half-an-hour at 230° to 240° according to the colour. Best Berlin black requires about fifty minutes at 360° to 400°. There is accommodation for fifty screens in each oven, thus giving a maximum stoving capacity of 450 screens per hour. The colour processing as carried out at Wembley is identical to that practised by Donald Macpherson & Co. and by many gas undertakings.

A large department is utilized for storage of the various types of firebricks required for the different classes of work. Thousands of these are always kept in stock and on order so as to ensure an ever-ready supply.

Marble and Wood Departments.

In the marble department the tiled fireplaces are built up. This operation is carried out with the face of the tiling downwards, and after building up the required de-



The " Portcullis " High-Temperature Radiant Panel with front-plate removed, showing the gas burners and refractory material within.

sign in frames, the back is covered with cement in which are buried strips of steel for strengthening and the feet of the protruding fixing lugs. In 24 hours the cement has set and the whole tiled surround can be turned over and liquid cement applied to fill in the interstices between the tiles. Wherever possible, British stone and marble are used, though other sources of supply include France, Belgium, and Sweden. All the glazed tiling is of British origin, some 400 different shades of coloured tiles being always in stock, including some very elaborate and beauti-

ful pictorial and patterned designs, in addition to a large variety of marbles of different types and shades.

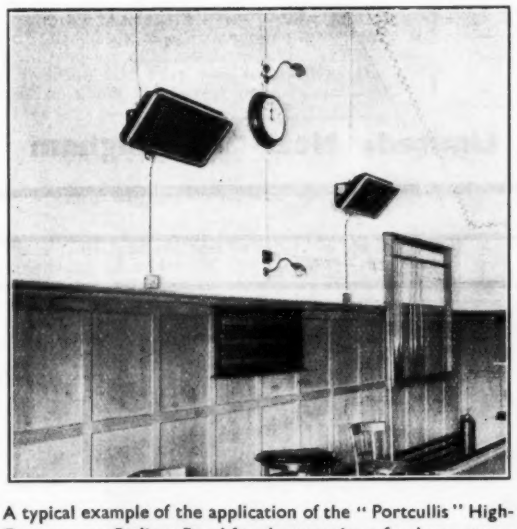
An adjacent room is utilized for the storage of a limited quantity of valuable marbles which are used for special jobs of a more expensive nature.

The wood department is concerned with the production of fireplace surrounds and mantelpieces, and some very attractive and elaborate settings are turned out. Hundreds of different designs of mouldings are available for ornamentation of the woodwork, the moulds being cast in a composition material and pinned on to the face of the setting. The carpenters' shops contain various types of power saws for cutting and shaping the wood, and four or five hundred different cutters are kept in stock for the moulding processes, all of which are carried out with great accuracy to fine limits.

All the departments having been dealt with, we finally reach the despatch section, and this in itself is a specialist job, in order to ensure that all goods reach their destination undamaged in transit. Great care is taken in the packing up of the products in straw-filled containers, and after the requisite checking up of the goods with the order forms they pass on to the railway company for long distance transit or to the firm's vans for delivery in London and the home counties. The firm have five large delivery vans in constant use for this purpose, the day's orders being prepared ready for delivery on the previous evening.

The Staff.

Bratt Colbran pay particular attention to the welfare of their staff, of which they have about 300 at the Wembley Works—an increase by 100% since removal from Cricklewood. Numbers are still steadily increasing.

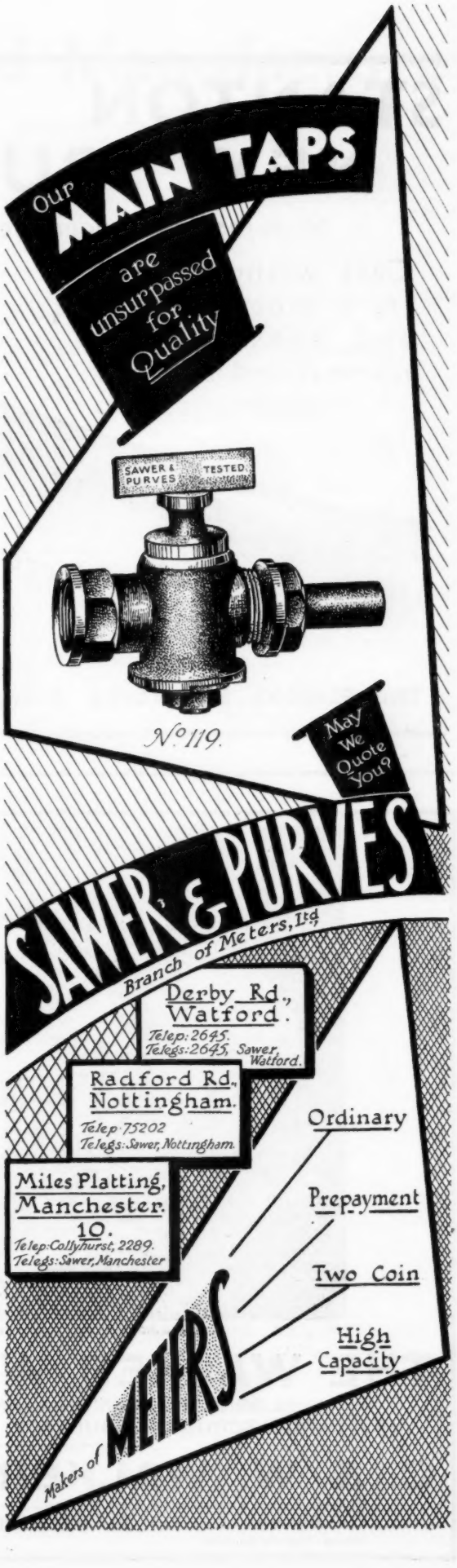


A typical example of the application of the "Portcullis" High-Temperature Radiant Panel for the warming of a large room.

They maintain a staff of fitters who are engaged in fitting work in London, together with others who are concerned with tiling work and fireplace fixing. It is gratifying to note that by far the largest demand at the present time is upon the firm's gas department, though to some extent the operatives are so trained as to be transferable from one department to another without difficulty. Indeed, 80% of the men engaged upon electrical appliance assembly are capable of dealing with gas apparatus if required. The firm have, however, at this stage been able to gauge the demand upon their various departments fairly accurately and can thus arrange their staff accordingly.

There is an up-to-date Works canteen, while there are two fully qualified first-aid men on the staff. In case of fire the factory is well safeguarded, fire mains, at 80 lb. pressure, being provided at seventeen different points. The shops are centrally heated by overhead pipes fed from two large coke boilers.

In these days of mechanization in all branches of commerce and industry, there is a natural tendency for the skilled craftsman gradually to disappear, and be superseded by machines which, if not completely automatic, often require merely the attention of unskilled operators. An impression gained by even a casual observation of the many processes carried out at Bratt Colbran's Wembley Works, however, is that here, at any rate, the skilled operative still holds his own. Indeed, the firm employ a remarkably high percentage of expert craftsmen, engaged in almost every phase of the manifold activities involved in their various productions.

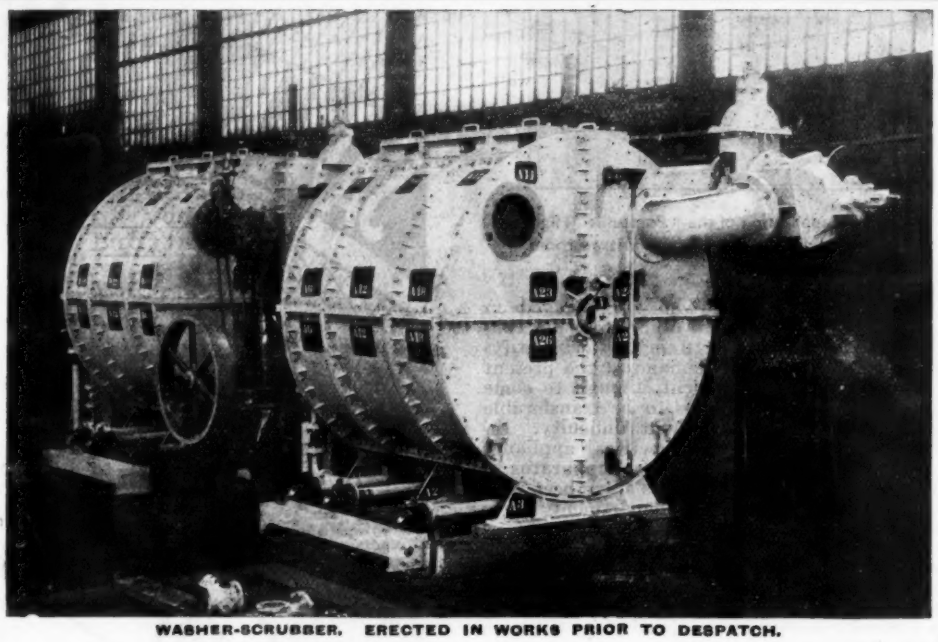


STANTON
NEW SPUN IRON PIPE

Manufactured under Delavaud and Mairy Patents

Cast without chill in a metal mould and subsequently normalised by heat treatment.

The Stanton Ironworks Company Limited, Near Nottingham



WASHER-SCRUBBER, ERECTED IN WORKS PRIOR TO DESPATCH.

THE WALKER WASHER-SCRUBBER.

ELIMINATES AMMONIA AND MOST OF THE CO_2 & H_2S.
HAS LARGE SCRUBBING SURFACE. REQUIRES SMALL POWER TO DRIVE.

C. & W. WALKER, LTD., DONNINGTON, Near WELLINGTON—SHROPSHIRE.

'Phone: Lilleshall-Shropshire Nos. 34 & 35 (2 lines) 'Grams: "Fortress," Donnington, Shropshire

LONDON OFFICE: 70, VICTORIA STREET, WESTMINSTER, S.W. 1.

'Phone: Victoria No. 1941 'Grams: "Fortress," Sowest, London

Gas Markets and Manufactures

Stock Market Report

(For Stock and Share Lists, see later pages)

The Stock Exchange started the New Year with active conditions and rising prices in many sections. The most noticeable feature was the heavy demand for industrial shares, and in a number of cases substantial appreciations in value were recorded. Home rails also shared in the movement on the publication of the Christmas traffic returns, while rubber, tea, and gold-mining shares were all well supported. The current week sees the opening of a new Account, which promises to be a heavy one, and also another conversion operation by the Australian Government.

The Gas Market was somewhat overshadowed by the activity in the more speculative sections and the volume of business was on the light side, though with few exceptions quotations remained unaltered. On the London Exchange, Watford and St. Albans was marked up 2 to 153½, the only other change of note being a drop of 5 points to 205 in Malta and Mediterranean. In the Provincial Lists, Hartlepool Gas and Water rose 3 to 119, and in the Supplementary List Oxford closed 10 points higher at 220, while several 5% debenture stocks hardened from 2 to 4 points.

In conformity with the usual practice, the lowest and highest prices of recorded transactions during the past year, excluding special bargains, have been inserted in the London Stock and Share List. In recent years it has been satisfactory to note that prices on the whole closed at or about the highest for the year under review, but unfortunately such is not the case for 1935. It will be seen that with the exception of a few "ordinaries"—*e.g.*, Alliance and Dublin, Gas Light units, North Middlesex, South Metropolitan, South Suburban, with a special mention of Shrewsbury which is now about 15 points up—the position last year was reversed as the majority of stocks closed on about the lowest price of the year.

Current Sales of Gas Products

The London Market for Tar Products.

Jan. 6.

There is little of interest to report in the tar products market, values being as under:

Pitch, about 40s. per ton f.o.b.

Creosote, about 5½d. per gallon.

Refined tar, 4d. per gallon in bulk at makers' works.

Pure toluole, 2s. 9d. to 2s. 10d.; pure benzole, 1s. 7d. to 1s. 8d.; 95/160 solvent naphtha, 1s. 8d. to 1s. 9d.; and 90/160 pyridine, about 4s. 9d.—all per gallon naked at makers' works.

Tar Products in the Provinces.

Jan. 6.

The average prices of gas-works products during the week were: Gas-works tar, 24s. 6d. to 29s. 6d. Pitch—East Coast, 42s. 6d. to 45s. f.o.b. West Coast—Manchester, Liverpool, Clyde, 42s. 6d. to 45s.* Toluole, naked, North, 2s. 1d. to 2s. 3d. Coal-tar crude naphtha, in bulk, North, 7¾d. to 8d. Solvent naphtha, naked, North, 1s. 5¾d. to 1s. 6¼d. Heavy naphtha, North, 1s. to 1s. 1d. Creosote, *ex* works, in bulk, North, liquid and salty, 4¾d. to 5d.; low gravity, 4½d. to 4¾d.; Scotland, 4¾d. to 5d. Heavy oils, in bulk, North, 4¾d. to 5d. Carbolic acid 60's, 2s. 4d. to 2s. 6d. Naphthalene, £13 to £15. Salts, 75s. to 80s., bags included. Anthracene, "A" quality, 2½d. to 3d. per minimum 40%, purely nominal; "B" quality, unsalable.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port it will be necessary to deduct the loading costs and the tolls whatever they may be.

Tar Products in Scotland.

GLASGOW, *Jan.* 4.

Prices continue firm and supplies of certain products are now definitely scarce in this district.

Crude gas-works tar.—The actual value is 30s. to 31s. per ton *ex* works in bulk.

Pitch is only available in comparatively small quantities at 35s. to 37s. 6d. per ton f.o.b. Glasgow for export, and round 35s. per ton *ex* works in bulk for home trade.

Refined tar is being sold at 2¾d. to 2⅞d. per gallon, f.o.r. makers' works in buyers' packages, according to quantity.

Creosote oil.—Available supplies are well looked after and meantime prices show no alteration. B.E.S.A. Specification, 5¼d. to 5½d. per gallon; low gravity, 5⅜d. to 5⅝d. per gallon; and neutral oil, 5⅝d. to 5⅞d. per gallon; all f.o.r. in bulk.

Cresylic acid.—It is practically impossible to secure supplies in this district and values are therefore nominal. Pale, 97/99%, 1s. 5d. to 1s. 5½d. per gallon; dark, 97/99%, 1s. 3d. to 1s. 3½d. per gallon; and pale, 99/100%, 1s. 5d. to 1s. 6d. per gallon; all *ex* works naked.

Crude naphtha is on short production and commands 5¼d. to 5¾d. per gallon, according to quality and district.

Solvent naphtha.—90/160 grade is 1s. 4d. to 1s. 4½d. per gallon, and 90/190 heavy naphtha is 11½d. to 1s. per gallon.

Motor benzole is 1s. 3½d. to 1s. 4d. per gallon in bulk at makers' works, with production well sold on contract.

Pyridines.—90/160 grade is 5s. to 5s. 6d. per gallon, and 90/140 grade, 5s. 6d. to 6s. per gallon.

Benzole Prices.

These are considered to be the market prices for benzole at the present time:

	s.	d.		s.	d.	
Crude benzole	0	9½	to	0	10	per gallon at works
Motor ,,	1	3	,,	1	3½	,, ,, ,,
90% ,,	1	4	,,	1	4½	,, ,, ,,
Pure ,,	1	7½	,,	1	8	,, ,, ,,

Contracts Advertised To-Day

Benzole Plant.
Port Talbot Gas Department. [p. 108.]

Boiler.
Port Talbot Gas Department. [p. 108.]

Coke Screening, etc., Plant.
Port Talbot Gas Department. [p. 108.]

Drying System.
Bury Markets Department. [p. 108.]

Gasholder.
Port Talbot Gas Department. [p. 108.]

General Stores (Iron, Tools, Paints, etc.).
Blackpool Corporation. [p. 108.]

Pipes (Concrete).
Blackpool Corporation. [p. 108.]

Trade Notes

Thermal Appliances, Ltd., Change of Address.

A change of address is announced by Thermal Appliances, Ltd., who have moved from Fulham Road to 26a, Peterborough Road, S.W. 6. (Tel.: Fulham 7531, as before.)

Alder & Mackay, Ltd.

We are advised by Messrs. Alder & Mackay, Ltd., that their branch at Kyrl's Quay, Cork, has been re-organized, and that Mr. David Hastie is now in charge as Works Manager.

F. C. Sugden & Co., Ltd.

Messrs. F. C. Sugden & Co., Ltd., Gas Engineers and Contractors, 10, East Parade, Leeds, 1, inform us that they have severed their connection as sole concessionaires for the North of England with the Calor Gas Distributing Company, Ltd.

The Vertical Gas Retort Syndicate, Ltd.

The Ardrossan Town Council have placed an order with the Vertical Gas Retort Syndicate, Ltd., 17, Victoria Street, Westminster, S.W. 1, for an improved type automatically-operated "Simplex" water gas plant. The new plant will be a duplicate of the existing installation.

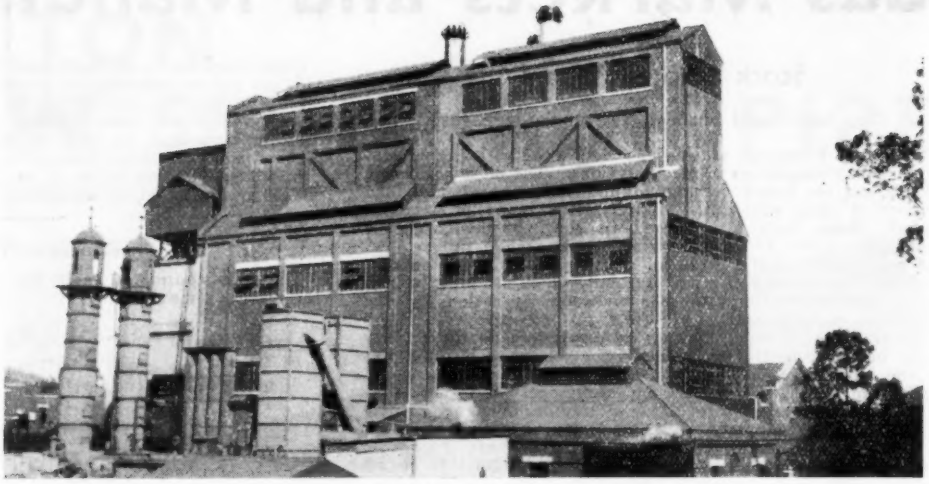
New Capital Issues

Stourport Gas Company.—Tenders for an issue of £10,000 4½% preference stock of the Stourport Gas Company are being invited by the Directors, the minimum price of issue being par. Tenders must be received not later than noon on Jan. 14, 1936. The Company, which serves the Stourport-on-Severn area, is one of the companies controlled by the Severn Valley Gas Corporation.

Diaries, Calendars, &c., Received

Seasonable gifts in the shape of useful diaries, calendars, &c., have been received from the undermentioned friends, whose good wishes are heartily reciprocated:

Brotherton & Co., Ltd., City Chambers, Leeds.
Dougall's Gas Meters, Ltd., Chiswick Mall, W. 4.
Gas Purification and Chemical Company, Ltd., Old Broad Street, E.C. 2.
Kings Patent Agency, Ltd., Queen Victoria Street, E.C. 4.
Oxley Engineering Company, Ltd., Leeds.
Peckett & Sons, Ltd., Bristol.
Priestley Studios, Ltd., Gloucester and London.
R. & A. Main, Ltd., Grosvenor Gardens, S.W. 1.



A new picture from South Africa showing (left) the first installation and (right) the second installation of Glover-West vertical retorts built to the order of the Johannesburg Municipal Gas Department at the Cottesloe gas works.

Practise **SCIENTIFIC CONTROL** *to the best advantage by adopting the*

WEST

SYSTEMS FOR MODERN GAS & COKE PRODUCTION

Glover-West Vertical Retorts • Westvertical Carbonizing Chambers • West Coal and Coke-handling Systems

DESIGN, MANUFACTURE AND ERECTION BY

WEST'S GAS IMPROVEMENT COMPANY, LTD.

MANCHESTER: Albion Ironworks, Miles Platting — 'Phone: COLLYHURST 2961 : 'Grams: "STOKER, MANCHESTER"

LONDON: Columbia House, Aldwych, W.C. 2 — 'Phone: HOLBORN 4108 : 'Grams: "WESGASCO, ESTRAND, LONDON"

STOCK AND SHARE LIST

Official Quotations on the London Stock Exchange

Issue. £	Stock or Share	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations Jan. 3.	Rise or Fall on Week.	Transactions, Lowest and Highest Prices During the Year 1935 (a)
1,551,868	Stk.	Sept. 9	7	7	Alliance & Dublin Ord. ...	133—143	...	128½—142⅝
374,000	,,	Dec. 16	4	4	Do. 4 p.c. Deb. ...	95—100*	...	96—100⅜
557,655	,,	Aug. 12	7	7	Barnet Ord. 7 p.c.	165—170	...	166—175
300,000	1	Oct. 7	1 9⅓	1 4†	Bombay, Ltd.	1⅝—1⅞	...	26/—33/-
178,480	Stk.	Aug. 12	9½	9½	Bournemouth sliding scale ...	222—232	...	224—237
550,050	,,	,,	7	7	Do. 7 p.c. max. ...	171—176	...	165—176
489,160	,,	,,	6	6	Do. 6 p.c. Pref. ...	150—155	...	148—155
50,000	,,	Dec. 16	3	3	Do. 3 p.c. Deb. ...	82—87*	...	87½—90½
262,025	,,	,,	4	4	Do. 4 p.c. Deb. ...	103—108*	...	107—111
335,000	,,	,,	5	5	Do. 5 p.c. Deb. ...	123—128*	...	124½—135
357,900	,,	Aug. 12	7½	7½	Brighton, &c., 6 p.c. Con. ...	170—175	...	172½—186
649,955	,,	,,	6½	6½	Do. 5 p.c. Con. ...	156—161	...	154½—165
205,500	,,	,,	6	6	Do. 6 p.c. 'B' Pref.	142—147	...	144—150
855,000	,,	Sept. 23	8	7	British Ord.	152—157	...	153—178½
100,000	,,	Dec. 16	7	7	Do. 7 p.c. Pref.	153—158*	...	150—165
350,000	,,	,,	5½	5½	Do. 5½ p.c. 'B' Cum. Pref.	110—115*	...	117
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb. ...	96—101*	...	95½—101⅔
450,000	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	107—112*	...	112½—116
200,000	,,	,,	17 6⅔	3⅓	Do. 3½ p.c. Red. Deb. ...	98—100*	...	...
100,000	10	22 May '33	6	4	Cape Town, Ltd.	1—3	...	20/—25/-
100,000	10	6 Nov. '33	4½	4½	Do. 4½ p.c. Pref. ...	1—3	...	20/-
150,000	Stk.	June 24	4½	4½	Do. 4½ p.c. Deb. ...	83—88	...	80—93
626,860	,,	July 22	6	6	Cardiff Con. Ord.	133—138	...	129¾—139
98,936	1	Sept. 23	2-	2-	Colombo, Ltd., Ord.... ...	1⅜—1⅞	...	35/—36/6
24,500	1	,,	1 4½	1 4½	Do. 7 p.c. Pref....	20/—22/-	...	20/6—22/-
609,204	1	Oct. 7	-/11·48	- 11·48	Colonial Gas Assn. Ltd. Ord.	19/6—21/6	...	20/3—22/3
296,053	1	,,	1/3·30	1/3·30	Do. 8 p.c. Pref.	24/6—26/6	...	25/—28/-
1,775,005	Stk.	Aug. 12	6	5	Commercial Ord.	100—105	...	101—127
620,000	,,	Dec. 2	3	3	Do. 3 p.c. Deb. ...	85—90	...	85—93
286,344	,,	Aug. 12	5	5	Do. 5 p.c. Deb. ...	121—126	...	122½—132
807,560	,,	Aug. 12	7	7	Croydon sliding scale ...	151—156	...	153—170⅓
569,590	,,	,,	5	5	Do. max. div.	113—118	...	114—121
620,385	,,	Dec. 16	5	5	Do. 5 p.c. Deb.... ...	121—126*	...	124—134½
239,000	,,	Aug. 12	5	5	East Hull Ord. 5 p.c.... ...	109—112	...	108—115½
181,625	,,	Aug. 12	6	6	East Surrey Ord. 5 p.c. ...	132—137	...	131—143⅓
175,609	,,	Dec. 16	5	5	Do. 5 p.c. Deb.	120—125*	...	120—127
19,313,481	,,	Aug. 12	5⅔	5⅔	Gas Light & Coke 4 p.c. Ord.	27/—28/-b	...	24/10½—29/-
2,600,000	,,	,,	3⅓	3⅓	Do. 3⅓ p.c. max.... ...	88—91	...	86½—97½
4,477,106	,,	,,	4	4	Do. 4 p.c. Con. Pref. ...	107—110	+1	104⅛—112½
8,602,497	,,	Dec. 2	3	3	Do. 3 p.c. Con. Deb. ...	89—91	...	84—94⅛
3,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	115—118	...	114—121
3,500,000	,,	,,	4½	4½	Do. 4½ p.c. Red. Deb. ...	111—114	...	112—120½
270,466	,,	Aug. 12	6	6	Harrogate New Cons. ...	132—137	...	135—139½
140,000	1	Sept. 23	1 7½	1 7½	Hongkong & China, Ltd. ...	1¼—1¼	...	25/—30/-
213,200	Stk.	Aug. 12	6	6	Hornsey Con. 3½ p.c. ...	130—135	...	129—137
5,600,000	,,	Nov. 4	14	8	Imperial Continental Cap. ...	184—189	-1½	175—222½
223,130	,,	July 22	3½	3½	Do. 3½ p.c. Red. Debs.	92—97	...	94—96
285,242	,,	Aug. 12	8⅔	8⅔	Lea Bridge 5 p.c. Ord. ...	175—180	...	175—180
165,736	,,	Aug. 26	10	8	Maidstone 5 p.c. Cap. ...	182—192	...	185
63,480	,,	Dec. 16	3	3	Do. 3 p.c. Deb. ...	79—84*	...	82⅜—85⅔
75,000	,,	Dec. 2	†10	†10	Malta & Mediterranean ...	200—210	-5	200—220
392,000	—	Oct. 1	5⅓	5⅓	Metropolitan (of Melbourne) 5½ p.c. Red. Deb.	98—103	...	103½—106½
231,978	Stk.	Aug. 12	5	5	M.S. Utility 'C' Cons. ...	108—113	...	111—113
818,657	,,	,,	4	4	Do. 4 p.c. Cons. Pref.	100—105	...	103—106
360,075	,,	Dec. 16	4	4	Do. 4 p.c. Deb. ...	101—106*	...	104½—106¾
148,955	,,	,,	5	†5	Do. 5 p.c. Deb. ...	120—125*	...	...
125,000	—	Jan. 2	3½	3½	Do. 3½ p.c. Rd. Rg. Bds.	96—99*	—1	100—101⅓
675,000	Stk.	Nov. 18	†3⅓	†3⅓	Montevideo, Ltd.	48—53	...	48—60
225,000	,,	Aug. 12	7½	7½	North Middlesex 6 p.c. Con.	170—175	...	163—177
396,160	,,	Aug. 12	5	5	Northampton 5 p.c. max. ...	105—110	...	111—112
300,000	,,	Nov. 4	†7	†9	Oriental, Ltd....	163—168	...	166½—174½
416,617	,,	Dec. 16	8	8	Plymouth & Stonehouse 5 p.c.	159—164*	...	164—186½
504,416	,,	Aug. 12	8½	8½	Portsm'th Con. Stk. 4 p.c. Std.	173—178	...	172—189½
241,446	,,	,,	5	5	Do. 5 p.c. max. ...	110—115	...	110—116
114,000	,,	July 22	5	5	Preston 5 p.c. Pref.	106—111	...	...
321,961	1	Sept. 23	...	1-	Severn Val. Gas Cor. Ld. Ord.	22/—23/-	...	22/—23/3
319,510	1	,,	...	-/10⅔	,, ,, 4½ p.c. Cum. Pref.	21/9—22/9	...	22/—22/9
133,201	Stk.	Aug. 12	5	8⅓	Shrewsbury 5 p.c. Ord. ...	147—152	...	135—159⅓
90,000	10	May 27	3	3⅓	South African... ...	3—4	...	70/—78/-
1,061,779	1	Sept. 23	1 2½	1 2½	South East'n Gas Cn. Ld. Ord.	27/6—28/6	...	27/—30/9
845,016	1	,,	-/10⅔	-/10⅔	Do. 4½ p.c. Red. Cum. Pref.	22/3—23/3	...	21/9—23/6
450,000	Stk.	Aug. 12	4	4	Do. 4 p.c. Red. Deb. ...	100—103	...	...
6,709,895	,,	Aug. 12	6⅓	5	South Met. Ord.	131—136	...	120—153
1,135,812	,,	,,	6	6	Do. 6 p.c. Irred. Pf....	147—152	...	148—155
850,000	,,	,,	4	4	Do. 4 p.c. Irred. Pf....	105—109	...	105—110⅓
1,895,445	,,	Dec. 16	3	3	Do. 3 p.c. Deb. ...	87—90*	...	84½—94
1,000,000	,,	July 8	5	5	Do. 5 p.c. Red. Deb. ...	115—118	...	115—121
1,543,795	,,	Aug. 12	6	6	South Suburban Ord. 5 p.c....	129—134	...	125—149⅓
512,825	,,	,,	5	5	Do. 5 p.c. Pref....	121—126	...	120—129⅓
500,000	,,	,,	4	4	Do. 4 p.c. Pref....	103—108	...	100—110⅓
888,587	,,	Dec. 16	5	5	Do. 5 p.c. Deb....	120—125*	...	122½—135
250,000	,,	,,	4	4	Do. 4 p.c. Deb....	103—108*	...	107⅓
415,907	,,	Dec. 2	...	4	S. Western Gas & Water Ord.	22/6—24/6	...	...
160,523	,,	Oct. 21	...	...	Do. 4½% Red. Cum. Pref.	22 —23/-	...	...
110,000	,,	Dec. 16	4	4	Do. 4½% Red. Deb. ...	98—103	...	...
647,740	,,	Aug. 12	5	5	Southampt'n Ord. 5 p.c. max.	115—120	...	116—120
121,275	,,	Dec. 16	4	4	Do. 4 p.c. Deb.	98—103*	...	102½
350,000	,,	Aug. 12	5½	5½	Swansea 5½ p.c. Red. Pref. ...	112—117	...	113½—118½
200,000	,,	Dec. 16	6½	6½	Do. 6½ p.c. Red. Deb. ...	96—101*	...	101—105
94,000	,,	...	...	...	Do. 3½ p.c. Red. Deb. ...	96—101*	...	...
1,076,490	,,	Aug. 12	6⅔	6⅔	Tottenham and District Ord.	149—154	...	148—169
409,835	,,	,,	5⅓	5⅓	Do. 5½ p.c. Pref....	130—135	...	131—137½
62,235	,,	,,	5	5	Do. 5 p.c. Pref. ...	120—125	...	117—127
334,615	,,	Dec. 2	4	4	Do. 4 p.c. Deb. ...	100—105*	...	103½—107½
369,774	,,	Aug. 12	7	7	Uxbridge, &c., 5 p.c. ...	152—157	...	151—172
108,330	,,	,,	5	5	Do. 5 p.c. Pref. ...	117—122	...	118—126
1,340,521	,,	Aug. 12	7	7	Wandsworth Consolidated ...	159—164	...	152—173
1,371,373	,,	,,	5	5	Do. 5 p.c. Pref. ...	121—126	...	121½—134½
1,317,964	,,	Dec. 16	5	5	Do. 5 p.c. Deb. ...	121—126*	...	126—136⅔
338,300	,,	,,	4	4	Do. 4 p.c. Deb. ...	102—107*	...	...
499,735	,,	July 8	6¾	6¾	Watford and St. Albans Ord.	151—156	+2	153—154½
200,000	,,	,,	5¼	5¼	Do. 5 p.c. Pref. ...	120—125	...	...
200,000	,,	,,	5½	5½	Do. 5½ p.c. Pref. ...	135—140	...	...
200,000	,,	Dec. 2	4	4	Do. 4 p.c. Red. Deb.	98—103	...	...
100,000	,,	,,	...	3½	Do. 3½ p.c. Red. Deb.	96—101	...	...
158,400	,,	Aug. 12	6c	5	Winchester W. & G. 5 p.c. Con.	114—119	...	118—124½

a.—Excluding special bargains. b.—The quotation is per £1 of Stock. c.—Paid £3, including 10s. on account of back dividends. * Ex div † Paid free of income-tax. ‡ For year. § Actual for three months.

Continued overleaf

Quarterly

CASES

IN

Green Grain Cloth,
Gilt-Lettered,

FOR

Binding
The
"Gas Journal"

PRICE **3/6** EACH.

Subscribers' Copies of The "GAS JOURNAL," bound in above,

AT

8/- per volume,
carriage extra.

WALTER KING, LTD.,
The "Gas Journal" Offices,
11, BOLT COURT, FLEET ST., E.C.4

STOCK AND SHARE LIST—Cont.

Stocks Officially Quoted on Provincial Exchanges

Issue. £	Stock or Share	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations. Jan. 3.	Rise or Fall on Week.	Transactions, Lowest and Highest of Week.
BRISTOL EXCHANGE.								
347,756	Stk.	July 22	6	5	Bath Cons.	122—124	...	...
1,667,250	,,	July 8	5	5	Bristol, 5 p.c. max.	118—120	...	...
120,420	,,	Dec. 16	4	4	Do. 1st 4 p.c. Deb. ...	100½—102½	...	...
217,870	,,	,,	4	4	Do. 2nd 4 p.c. Deb. ...	100—102	...	...
328,790	,,	,,	5	5	Do. 5 p.c. Deb.	125—128	...	...
274,000	,,	Aug. 12	5	5	Newport (Mon.) 5 p.c. max....	113—118	...	...
13,200	12	Aug. 26	8⅔	7	Pontyp'l Gas & W. 10 p.c. 'A.'	14½—15½	...	...
13,600	10	,,	6	5	Do. 7 p.c. 'B.'	11½—12½	...	...
40,000	10	,,	6	5	Do. 7 p.c. 'C.'	11½—12½	...	...
140,778	Stk.	Aug. 12	5	5	Weston-super-Mare Cons. ...	115—117	...	...
64,338	,,	Dec. 16	4	4	Do. 4 p.c. Deb.	96—98	...	...
33,340	,,	,,	7½	7½	Do. 7½ p.c. Deb.	165—169	...	...
LIVERPOOL EXCHANGE.								
157,150	Stk.	Aug. 12	6½	5	Chester 5 p.c. Ord.	109—114	...	...
92,500	,,	Dec. 16	4	4	Do. 4 p.c. Pref.	100—105	...	...
32,540	,,	,,	3½	3½	Do. 3½ p.c. Deb. ...	91—96	...	...
41,890	,,	,,	4	4	Do. 4 p.c. Red. Deb. ...	100—105	...	...
2,167,410	,,	Aug. 12	6	6	Liverpool 5 p.c. Ord. ...	133—135	...	135
245,500	,,	Dec. 16	5	5	Do. 5 p.c. Red. Pref. ...	103—108	...	...
306,083	,,	July 8	4	4	Do. 4 p.c. Deb. ...	105—107	...	...
106,280	,,	July 22	10	10	Preston 'A' 10 p.c. ...	206—216	...	...
188,219	,,	,,	7	7	Do. 'B' 7 p.c.	142½—152½	...	...
NEWCASTLE EXCHANGE.								
122,577	Stk.	Aug. 12	8	8	Blyth 5 p.c. Ord.	151—153	...	...
732,000	,,	Aug. 12	5	5	Hartlepool G. & W. Cn. & New	118—120	- 3	...
2,061,315	,,	Aug. 12	5⅔	5	Newcastle & Gateshead Con.	25 —25 6d	...	...
682,856	,,	,,	4	4	Do. 4 p.c. Pref. ...	107—108	..	...
776,706	,,	Dec. 16	3½	3½	Do. 3½ p.c. Deb. ...	100—102	+ 1½	...
277,285	,,	Oct. 21	5	5	Do. 5 p.c. Deb. '43...	105—106	...	...
209,820	,,	Aug. 12	8½	8½	South Shields Con.	171—173	...	...
299,542	,,	Aug. 12	6	6	Sunderland 6 p.c. max. ...	129—131	...	...
NOTTINGHAM EXCHANGE.								
542,270	Stk.	Aug. 12	10	7	Derby Con.	175—185	...	...
55,000	,,	Dec. 16	4	4	Do. 4 p.c. Deb.	100—105*	...	...
84,750	,,	Aug. 26	12	5	Long Eaton 'A' Ord. ...	150—160	...	...
50,000	,,	,,	10	4	Do. 'B' Ord. ...	130—140	...	...
20,000	10	June 7	5	5	Do. 5 p.c. Pref. ...	10—12	...	...
80,000	Stk.	,,	5	5	Do. 5 p.c. Deb. ...	117—122	...	...
SHEFFIELD EXCHANGE.								
10,000	Stk.	Aug. 26	10	10	Great Grimsby 'A' Ord. ...	220—230	...	...
6,500	,,	,,	10	10	Do. 'B' Ord. ...	220—230	...	...
79,000	,,	,,	10	10	Do. 'C' Ord. ...	205—215	...	...
1,736,968	,,	Aug. 26	6	6	Sheffield Cons.	140—142	...	...
95,000	,,	Dec. 16	4	4	Do. 4 p.c. Deb.... ...	100½—102½*	...	...

¤ The quotation is per £1 of Stock. * Ex div.

Supplementary List of Stocks and Shares not Officially Quoted

60,000	10	Sept. 9	10	10	Ascot 10 p.c. max.	22—24	...	...
58,680	10	,,	7	7	Do. 7 p.c. max.	14½—15½	...	...
90,000	1	Nov. 4	5	5	Assd. Gas and Water Ord....	21/—23/-	...	...
90,000	1	,,	4½	4½	Do. 4½ p.c. Cum. Pref. ...	21 9—22 9	...	...
17,000	Stk	Aug. 26	8	8	Bognor Orig. Ord. 'A' ...	164—174	...	...
62,210	,,	,,	8	8	Do. New Addl. 'A' ...	164—174	...	...
87,160	,,	,,	7	7	Do. New 7 p.c. max. ...	142—147	...	...
37,440	,,	July 22	10	10	Cam.Univ. & Town 10 p.c.max.	214—224	...	...
125,970	,,	,,	7	7	Do. 7 p.c. max.	161—166	...	...
39,025	,,	,,	5	5	Do. 5 p.c. max.	110—115	...	...
65,000	,,	Aug. 12	8½	7½	Eastbourne 'A' 5 p.c. ...	153—158	...	...
198,000	,,	,,	7	6	Do. 'B' 3½ p.c.	135—140	...	...
112,312	,,	,,	5	5	Do. 5 p.c. Pref.	120—125	...	...
130,000	,,	Dec. 16	5	5	Do. 5 p.c. Deb.	122—127	+4	...
250,000	1	Nov. 18	...	4	Gas Consolidation Ord. ...	20 6—22 6	...	...
250,000	1	,,	...	4	Do. 4 p.c. Red. Cum. Pref.	19 6—20 6	...	...
117,251	Stk.	Sept. 23	8 1/10	8 1/10	Gosport District Cons. ...	177—182	...	...
73,350	,,	,,	5	5	Do. 5 p.c. Pref.	113—118	...	...
24,000	30	Aug. 12	8⅓	8⅓	Great Yarmouth 8⅓ p.c. max.	53—58	...	...
59,400	30	,,	7⅓	7⅓	Do. 7⅓ p.c. max.... ...	43—46	...	...
51,160	Stk.	Dec. 2	5⅓	5⅓	Do. 5⅓ p.c. Deb.... ...	123—128	...	...
152,600	,,	Aug. 26	8	8	Guildford Cons.	170—175	...	...
54,055	,,	,,	5	5	Do. 5 p.c. Pref.	116—121	...	...
68,250	,,	Dec. 16	5	5	Do. 5 p.c. Deb.	120—125	+3	...
156,600	,,	Aug. 12	7¾	7¼	Hampton Court Cons. ...	170—180	...	...
81,660	10	Feb. 4	9	9	Leatherhead Ord.	16—17	...	...
107,960	10	Sept. 23	5	4	Mid Kent Ord.	9⅛—10⅛	...	...
230,445	Stk.	Aug. 12	10	10	Oxford & District Ord. ...	215—225	+10	...
47,112	,,	,,	5	5	Do. 5 p.c. Pref.	117—122	...	...
50,000	,,	,,	6	6	Do. 6 p.c. Red. Pref. ...	115—120	...	...
126,193	,,	Nov. 18	7½	7½	Peterborough Ord.	160—170	...	...
317,638	,,	Aug. 26	5	5	Reading 5 p.c. max.	108—113	...	...
60,000	,,	,,	5	5	Do. 5 p.c. Red. Pref. ...	105—110	...	...
64,990	,,	Sept. 9	7½	6½	Redditch Ord.	116—121	...	...
166,850	,,	Aug. 12	7	7	Romford Ord.	167—172	...	...
60,000	,,	,,	4	4	Do. 4 p.c. Pref.	97—100	...	...
44,000	,,	Sept. 23	5	5	Do. 5 p.c. Deb.	121—126	...	...
110,950	,,	Aug. 26	8	8	Ryde Ord.	168—173	...	...
236,191	,,	July 22	7	5	Scarborough Ord.	130—140	...	...
77,825	,,	Aug. 26	8	8	Shanklin & Ventnor Cons. ...	155—165	...	...
240,643	,,	Sept. 23	7	7	Slough Ord.	150—155	...	...
21,000	,,	Dec. 16	5	5	Do. 5 p.c. Deb.	116—121	...	...
28,872	1	Nov. 4	5½	5½	S. Midland Gas Cpn.Ltd. Ord.	20/—22/-	...	...
28,866	1	Sept. 9	4½	4½	Do. 4½ p.c. Red. Cum. Pref.	20/—22/-	...	...
124,930	Stk.	Aug. 12	7	7	Southgate & Dist. 7 p.c. max.	150—155	...	...
62,500	,,	,,	5	5	Do. 5 p.c. Pref.	117—122	...	...
117,228	,,	Aug. 12	6	5	Swindon Cons.	113—118	...	...
60,425	,,	Dec. 16	5	5	Do. 5 p.c. Deb.	120—125	+2	...
750,000	1	...	...	...	Utd. Kingdom Gas Cpn. Ord.	1⅛—1⅜	...	21/—22/-
160,910	1	Nov. 18	...	2½	Do. 4½ p.c. Prefd. Ord....	19 6—20 6	...	20/11
910,910	1	,,	...	2½	Do. 4½ p.c. Cum. Pref. ...	20/6—21/6	...	20/9—20/10½
400,000	Stk.	,,	...	...	Do. 3½ p.c. Red. Deb. ..	98—101	...	...
130,000	,,	Aug. 12	8	5	Wakefield Ord.	140—150	...	...
81,650	,,	...	5	5	Do. 5 p.c. max.	103—108	...	...
82,000	,,	July 22	6	6	Weymouth Ord.	101—106	...	...
370,000	,,	,,	6	4	York Cons.	107—112	...	111
90,000	,,	Dec. 16	5	5	Do. 5 p.c. Red. Deb. ...	103—108	...	...
133,640	,,	Aug. 12	6½	6½	Yorktown (Cam.) 5 p.c. Cons.	120—125	...	...
100,000	,,	,,	5	5	Do. 5 p.c. Pref.	117—122	...	...
35,000	,,	Dec. 16	5⅓	5	Do. 5⅓ p.c. Deb.... ...	126—131	...	...

Service

The value of your Sales and Service men is gauged by the knowledge they possess of matters pertaining to the Industry they serve. The more knowledge they possess the greater the assistance they can be towards building up an efficient and successful organization.

At little cost, the "GAS SALESMAN" (published monthly) offers a ready means to this end. As the only separate publication devoted exclusively to the sales and service side of the Industry, it has an individuality of its own and keeps its readers abreast of the times.

Do all your sales and service men regularly receive a copy of each month's issue?

Specimen copies will gladly be supplied on request.

The annual subscription is 6s.

All communications to Walter King, Limited, The "GAS SALESMAN" Offices, 11, Bolt Court, Fleet Street, London, E.C. 4.